# GROUNDWATER AND SURFACE WATER STUDY REPORT

SILVER CREEK TAILING SITE
SUMMIT COUNTY, UTAH
EPA ID# 980851404

Prepared by
The Utah Department of Health
In Cooperation With
U.S. Geological Survey

GROUNDWATER AND SURFACE WATER STUDY REPORT

SILVER CREEK TAILING SITE
SUMMIT COUNTY, UTAH
EPA ID# 980851404

Prepared by
The Utah Department of Health
In Cooperation With
U.S. Geological Survey

TABLE OF CONTENTS



6880U/8

## LIST OF TABLES



## LIST OF FIGURES



## ATTACHMENTS

## 1.0 INTRODUCTION

In September of 1985, the Silver Creek Tailings site (also known as "Prospector's Square" and "Park City") was nominated by EPA for inclusion on the Superfund National Priorities List. The Superfund law expired in late 1985 and reauthorization of the program was delayed until October 17, 1986. During this period, no final National Priorities List decision was made by EPA on the Silver Creek Tailings nomination and no follow-up field work or work plan development occurred.

On October 17, 1986, the Silver Creek Tailings site was removed from its status as a proposed site on the National Priorities List pursuant to Section 118 (p) of the Superfund Amendments and Reauthorization Act of 1986 (SARA). The site was deemed removed from the NPL unless EPA determined that a potential threat to the public, welfare or the environment exists at the site. Section 118 (p) of SARA specified that such a determination shall be based "upon site specific data not used in the (previous) proposed listing of such facility". Pursuant to the passage of SARA, the U.S. Environmental Protection Agency, the State of Utah and Park City Municipal Corporation signed a Site Investigation Agreement for an expanded site investigation of the Silver Creek Tailings Site, Park City, Utah in July 1987.

This agreement between Park City, the State of Utah (STATE) and the United States Environmental Protection Agency Region VIII (EPA) establishes the roles and responsibilities, of these respective agencies (the "Participants") in completing an expanded site investigation and health assessment of the Silver Creek Tailings site in Park City, Utah. The purpose of the Site Investigation and health assessment is to determine if any releases of contaminants from the tailings at the site pose a threat to human health or the environment.

Specifically the study included:

1. Environmental sampling to determine whether contaminants are being released from the tailings through the air for ingestion, through the surface water to Silver Creek, or through the soils/groundwater to the shallow or deep aquifers underlying the site; and

2. A health assessment to determine whether any releases of contaminants from the tailings through these pathways present a threat to human health. The Agency for Toxic Substances and Disease Registry has already completed this study.

All activities conducted during this site investigation were described in, and accomplished in accordance with approved work plans, sampling plans, health/safety plans, and quality assurance project plans (QAPP), collectively referred to as project plans. A detailed Work Plan for the ground water/surface investigation was prepared and approved by the participants in May 1987. Modifications to the work plan were approved by all participants. These modifications are included in Attachment C. This report summarizes the findings of the groundwater/surface water study. A separate report for the air study is also being finalized. The Utah Health Department was designated as the lead agency for this study with input from all participants: Ecology and Environment, Inc. provided the drilling and analytical support throughout the project. The U.S. Geological Survey provided their technical expertise and conducted all field activities jointly with the Utah Health Department and EPA.

## 2.0 PROJECT OBJECTIVES

The objectives of this study were five-fold. First, to determine if hazardous substances are being released to the groundwater and or surface water. Second, to characterize the groundwater/surface water in the area by studying physical/chemical parameters and their seasonal variations. Third, to determine if there is a hydraulic interconnection between the unconsolidated valley fill and the consolidated rock aquifer. Fourth, to study the geologic/hydrologic environment of the study area. Fifth, to study the approximate depth and volume of tailings in the area and their chemical composition.

## 3.0 SITE DESCRIPTION

### 3.1 SITE LOCATION AND HISTORY

The Silver Creek Mine Tailings/Prospector Square site is located approximately 30 miles east of Salt Lake City on the eastern flank of the Wasatch Mountain Range, in the NE 1/4, Section 9, NW 1/4, Section 10, Township 2 South, Range 4 East, Salt Lake Principal Meridian; Summit County, Utah (Figure 6). The tailings are located approximately one-half mile northeast of Park City's business district, at the intersection of Highway 224 and alternate U.S. 40.

The Park City District has been the site of precious metal mining since its discovery of silver in 1869. The processing of millions of tons of ore over the decades since the first discovery has generated a large volume of mine tailings. These mine tailings have been disposed in various areas near Park City, one such area is Prospector Square, which is the subject of this investigation.

Mill tailings were first deposited on Prospector Square in the early 1900's. It is suspected that some of the tailings were slurried to Prospector Square via Silver Creek. Mill tailings were deposited at Prospector Square until the 1930's. Mine tailings derived from the milling of precious metal ore generally contain elevated levels of heavy metals including arsenic, cadmium, chromium, lead and zinc. The tailings were uncontained, cover approximately 80 acres, range in depth from 1 to 10 feet and have been very accessible to the inhabitants of Park City. The tailings are a potential source of contamination to the area's surface water, ground water and air environments.

In the 1940's Pacific Bridge, Inc., reworked the tailings and used solvents and acids to extract (leach out) the residual silver that had remained in the tailings after the initial milling process. Pacific Bridge used an in-situ leaching process.

In the late 1970's commercial developers started building businesses at Prospector Square. The tailings were not covered and are still exposed in undeveloped areas of Prospector Square. This area has been undergoing rapid growth in the last several years. Currently, the site is occupied by roads, residences, landscape, parking lots, or retail buildings. Approximately two acres of uncovered tailings remain. However, plans are now being developed by Park City to cover the exposed tailings. Approximately 170 single family residential structures and many multi-family units have been built or are planned.

## 3.2 DESCRIPTION OF STUDY AREA

### 3.2.1 Physiography

The Prospector Square area lies within the Middle Rocky Mountains physiographic province (Fenneman, 1931). Altitudes range from about 6,700 feet on the valley floor to about 10,000 feet in the adjacent Wasatch Range to the southwest. The area is divided by a slight topographic high which results in two separate drainages. Most of the Prospector Square area is drained by Silver Creek which flows to the east; but, McLeod Creek, a tributary of East Canyon Creek, drains some of the northwestern part of the area and flows to the north.

### 3.2.2 Geology

Consolidated rocks in the Prospector Square area and the surrounding mountains range in age from Pennsylvanian through Tertiary, and the overlying unconsolidated valley fill is of Quaternary age (Figure 3). The consolidated rocks which crop out or underly the unconsolidated valley fill are of sedimentary origin with sandstone, limestone, shale, and quartzite being the most prevalent. The unconsolidated valley fill is primarily composed of alluvial deposits.

The region surrounding the Prospector Square area was structurally deformed by folding and faulting. The folding has resulted in most of the consolidated rocks in the study area dipping to the north and northwest (fig. 3). Most of the deformation is related to high-angle thrust faults and has resulted in a complex geologic framework with extensive fracturing in most of the consolidated rocks. In limestone, such as the Thaynes Formation, the fractures have been enlarged by dissolution. Due to the deformation properties of each type of rock, local fracture patterns are present but no regional fracture patterns are apparent.

## 3.3 SURFACE-WATER HYDROLOGY

Sources of streamflow in the Prospector Square area are rain or melting snow, direct groundwater discharge to the stream and drains and spring discharge. Silver Creek, which flows along the southern portion of the unconsolidated valley fill, derives its flow from runoff in the mountains south of Park City. Silver Creek exits the study area through a narrow canyon on the east side and flows towards Richardson Flat (Figure 1).

Holmes, Thompson, and Enright (1986, p. 11) report an estimated average annual flow of 0.8 cubic feet per second in the upstream portion of Silver

Creek south of Park City. The annual flow through the Prospector Square area probably would not be significantly greater due to the lack of significant inflow from other drainages or springs. Immediately south of the Prospector Square area, flow in Silver Creek is largest during spring runoff and usually goes dry during the summer months.

Most of the water in the Pace-Homer Ditch is derived from groundwater sources. The Pace-Homer Ditch originates near the Park Meadows Golf Course where it collects water from a series of ponds and drains. Dority Spring, the Pace and Homer Spring areas, and at least two drains also discharge water into the ditch in this area. The Pace-Homer Ditch probably receives some direct seepage of groundwater from the unconsolidated valley fill before it joins with Silver Creek east of Prospector Square.

The flow in the Pace-Homer Ditch is measured at a two-foot Parshall flume located above the first diversion where water is allowed to enter Silver Creek. Data are collected at the flume during the summer months (May through September) and the measurements of flow are compiled in the Weber River Distribution System annual reports. During years of normal precipitation, the discharge varies between about 3 and 6 cubic feet per second, with the long-term average discharge being about four cubic feet per second. Some water from the Spiro Tunnel, which usually flows into the East Canyon drainage, may be diverted through ditches into the Pace-Homer Ditch to fulfill water obligations to downstream water users in the Silver Creek drainage.

## 3.4 GROUNDWATER HYDROLOGY

Ground water within the Prospector Square area occurs in both unconsolidated valley fill and consolidated rocks. The unconsolidated valley fill is limited to the lower parts of the area, whereas consolidated rocks form the mountainous terrain surrounding the valley and underlie the unconsolidated valley fill. Although groundwater in the unconsolidated valley fill is not used for municipal and industrial purposes, there is concern about the quality of the water and whether there is a potential for movement into the consolidated rocks. Groundwater in the permeable consolidated rocks, such as the Thaynes Formation, is a primary source of municipal water. Records of observation wells are given in table 1, lithologic logs in table 2, water levels in table 3, and results of slug tests in table 4.

### 3.4.1 Water in Unconsolidated Valley Fill

Water in the unconsolidated valley fill generally is unconfined but may be semiconfined at depth. The unconsolidated valley fill in the Prospector Square area is primarily of alluvial origin. The deposits generally are poorly sorted and consist of clay, silt, sand, gravel, cobbles, and boulders. Some local deposits of well-sorted, coarse-grained material are present near the Pace-Homer Ditch. The unconsolidated valley fill underlying the Silver Creek Tailings Site is comprised of poorly sorted clay, sand, and gravel, with intermittent layers of clay.

The unconsolidated valley fill ranges in thickness from a few feet near hills and mountain fronts to at least 260 feet at the Pacific Bridge well. The fill is probably less than 20 feet thick where Silver Creek exits the area through a canyon on the east side of the study area.

3.4.1.1 Recharge

Recharge to the unconsolidated valley fill is derived from leakage from consolidated rocks, from stream losses from Silver Creek and other ditches, and from infiltration of precipitation and unconsumed irrigation water. Silver Creek is a primary source of recharge during the spring and summer months. Discharge measurements (table 5) show streamflow losses of 15 to 25 percent of the flow during normal to high flows and virtually 100 percent losses during low-flow conditions. Holmes, Thompson, and Enright (1986, p. 14) estimated that recharge to the unconsolidated valley fill from precipitation and unconsumed irrigation water to be 1 acre-foot per acre per year.

3.4.1.2 Movement

In theory, the conceptualized direction of groundwater flow in the unconsolidated valley fill would parallel the general slope and direction of the major streams. However, in the Prospector Square area, the water table surface of the shallow, unconsolidated valley-fill aquifer, shown in figure 4, indicates movement of water away from Silver Creek in a northeasterly direction. In the eastern portion of the study area, the general flow direction is to the east, toward the Pace-Homer Ditch. Seasonal water-level fluctuations would not substantially change the configuration of water-table surface and direction of flow.

A downward component of groundwater flow exists at three sites where monitoring wells were completed in the shallow unconsolidated valley fill and near the unconsolidated valley-fill/consolidated-rock contact. The downward vertical hydraulic gradient was measured to be about six feet at wells PS-MW-1s and PS-MW-1d. In the Prospector Square area near Silver Creek, the downward gradient was measured to be greater than 10 feet at wells PS-MW-5 and PS-MW-5d. Toward the east end of the Prospector Square area, the downward gradient was generally three feet as measured at wells PS-MW-7 and PS-MW-7d.

3.4.1.3 Discharge

Discharge from the unconsolidated valley fill in the Prospector Square area is primarily through seepage to drains and streams and subsurface outflow. Discharge by evapotranspiration is small. When phreatophyte vegetation was more prevalent, prior to residential development, discharge by evapotranspiration from plants probably was greater.

Seepage to drains and streams -- Drains at the lower end of the area are used to dewater the shallow, unconsolidated valley fill. The discharge from two drains in the immediate area were measured at the time of sampling. During spring and summer months when groundwater levels are near their peak, the combined discharge was approximately 0.4 cubic feet per second; and during winter months, the combined discharge was approximately 0.1 cubic feet per second. A new sewer line that parallels the Pace-Homer Ditch and exits the area along Silver Creek may be considered a drain because the fill around the pipe may provide a conduit of high permeability through which groundwater may readily flow. Data were not collected to estimate discharge from this source.

Seepage from the unconsolidated valley fill to the Pace-Homer Ditch can be calculated by subtracting Dority Spring discharge, the discharge from the drains, and the flow of any water diverted into the area from the Spiro Tunnel from the discharge at the Parshall flume below Prospector Square. Data necessary for this calculation were collected only during the interference test and the results are discussed later in this report.

Subsurface outflow -- Discharge by subsurface outflow is restricted to the narrow canyon on the eastern side of the area. The saturated thickness of the fill in the area is probably less than 20 feet, the gradient is small, and the permeabilities are low. Thus, the amount of subsurface outflow is small with the exception of the fill around the sewer line, where artificially high permeabilities may allow larger rates of groundwater flow.

3.4.1.4 Seasonal Water-Level Fluctuations

Seasonal water-level fluctuations in the unconsolidated valley fill are a result of fluctuations in recharge and discharge. The degree of fluctuation generally is related to the distance, both vertical and horizontal, from the source of recharge and points of discharge, the permeabilities of the fill, the rates of recharge and discharge, and storage coefficient. Water levels are lowest in winter months when recharge is minimal and are highest in spring months after maximum recharge has occurred due to melting snow and high flows in streams.

Monitoring wells PS-MW-4 and PS-MW-5, near Silver Creek, show large water-level rises in the spring, with most of the remaining monitoring wells showing water level rises of a lesser degree (fig. 5). Well PS-MW-5 responds more rapidly to the influence of Silver Creek than does PS-MW-5d which is open to a deeper zone. During the spring months, the downward hydraulic gradient in these two wells increased from more than 10 feet on February 25, 1988, to over 14 feet on May 5, 1988. Water levels in monitoring wells PS-MW-1d and PS-MW-14 and the Cartier well are not located near Silver Creek, but the rises may be due to increased leakage from other small streams or irrigation ditches in the area. Water-level rises in PS-MW-1d may be due to upward leakage from the underlying consolidated rocks which receive recharge from nearby low-lying hills where the consolidated rocks crop out.

Water-level declines in the monitoring wells generally are gradual and occur over a several-month period during the fall and winter. This indicates that discharge is an ongoing process throughout the year, whereas recharge is concentrated in the late winter-early summer period. The result is rapid water-level rises in the spring and summer followed by gradual declines during the fall and winter.

Generally, water-level fluctuations are smaller in wells located further to the northeast of Silver Creek. This is most noticeable in well PS-MW-11 where the water level only varies by about 1 foot. However, water-level changes in monitoring well PS-MW-9, located in the city park next to the Pace-Homer Ditch, respond rapidly and directly to the amount of flow in the ditch. Similarly, well PS-MW-10, located near Silver Creek east of the Prospector Square area, responds to the flow in the creek.

### 3.4.1.5 Hydraulic Properties

The U.S. Geological Survey performed slug tests on 16 of the 18 monitoring wells installed as part of this study. Monitoring wells PS-MW-13 and PS-MW-14 were not tested because grout probably imprenated the sand pack after completion of the wells, thus, leading to uncertainties in the results. A cylinder was lowered into the 2-inch-diameter monitoring wells and when the waste level in the well had returned to the original level, the cylinder was removed quickly and the recovering water levels were recorded at 2-second intervals using a pressure transducer and an electric data-logger. The data were analyzed using methods described by Bouwer and Rice (1976) and Cooper and others (1967). The solution described by Bouwer and Rice (1976), which was developed for unconfined conditions, is based on the assumption that the aquifer is isotropic; the solution omits storage in the aquifer, and treats the water table as a fixed, constant-head boundary. The solution described by Cooper and Others (1967) is based on the assumption that the aquifer is confined, isotropic, and not leaky. The monitoring wells tested in the Prospector Square area represent partially-penetrating piezometers in an anisotropic, unconfined aquifer, and, therefore, an appropriate analytical solution to the boundary conditions does not exist. As a result, the values for hydraulic conductivity in table 4 have been rounded to the nearest whole number, and, in some instances, where the data poorly matched the type surves, the values have been rounded to the nearest order of magnitude.

The values of hydraulic conductivity listed in table 4 were calculated based on the length of the production zone which is the thickness of the sand pack and this thickness varies in each monitoring well. The range of values for hydraulic conductivity, 1 to 14 feet per day, is similar to that representative of fine sands, silts, and mixtures of sand, silt and clay; and according to Chow (1964, p. 13-10), this range is representative of poor or the lower end of good aquifers, with three feet per day being the value separating poor from good aquifers. In wells at which the water-bearing material has a hydraulic conductivity of three feet per day or less, the predominant lithology is clay with interbedded silt, fine sand, and gravel. Wells at which the water-bearing material has a hydraulic conductivity of greater than three feet per day, the predominant lithology is the same, but layers of sand or sand and gravel may be present within the production interval.

The vertical hydraulic conductivity probably can be assumed to be at least one order of magnitude smaller than the horizontal hydraulic conductivity. Assuming one feet per day is representative of unsorted clay, sand, and gravel, then the vertical hydraulic conductivity probably would not be greater than 0.1 feet per day. This value could be considerably smaller where layers of clay are present.

### 3.4.2 Water in Consolidated Rocks

Consolidated rocks in the Prospector Square area are an important source of water due to their large areal extent and ability, locally, to yield large quantities of water to wells. The consolidated rocks crop out or are covered by a thin layer of unconsolidated valley fill in the higher altitudes of the area and in a large portion of the valley floor.

Extrusive igneous rocks of Tertiary age are present in the northeast corner of the study area but are not hydrologically important. However, most of the consolidated rocks are fractured with the movement of water primarily along these fractures. Consolidated rocks which yield the most water are Limestone, in which fractures have been enlarged by solution dissolution.

3.4.2.1 Recharge

Recharge to the consolidated rocks which underlie the Prospector Square area is primarily from precipitation and stream infiltration and occurs in the high-altitude areas bordering the western and southwestern part of the study area. Most of the precipitation, which exceeds 40 inches per year in the highest parts of the tributary area, falls as snow during winter and spring. Recharge to the consolidated rocks occurs after the soil crust has thawed sufficiently and soil moisture reaches saturation, thus allowing water to infiltrate through the thin veneer of soil. Recharge to the consolidated rocks due to stream losses also occurs in higher altitudes. Holmes, Thompson, and Enright (1986, p. 22) reported that these losses can be inferred if streamflow from a drainage basin is significantly smaller than the streamflow estimated from empirical equations incorporating drainage area and precipitation. Thaynes Canyon Creek, which heads in the mountains west of the Prospector Square area, generally has a smaller streamflow than would be expected and is probably a major source of recharge to the Thaynes Formation.

3.4.2.2 Movement

Water in the consolidated rocks generally moves from recharge areas at high altitudes to the discharge area at low altitudes. Water moves along faults and fractures due to the lack of primary permeability in consolidated rocks. Drain and mine tunnels have changed the direction of groundwater movement in some consolidated-rock formations. In some portions of the consolidated rock adjacent to the tunnels, groundwater now moves toward and discharges to these tunnels. Within the study area, not enough water-level information exists from the consolidated rocks underlying the unconsolidated valley fill to determine the direction of groundwater movement from one rock formation to another.

An upward vertical hydraulic gradient exists between the Woodside Shale and the overlying unconsolidated valley fill in the vicinity of the Pacific Bridge well. Water-level measurements at the Pacific Bridge well and the adjacent monitoring well, PS-MW-2, show an upward gradient of over 10 feet during the winter months and over 17 feet in early May (Table 3). Although data are available only in this local area, an upward gradient between the consolidated rocks and the overlying valley fill probably exists throughout most of the Prospector Square area.

A downward gradient in the unconsolidated valley fill, mentioned previously, and an upward gradient between consolidated rocks and the unconsolidated valley fill indicates the possible existance of a layer of well-sorted material at the base of the unconsolidated valley fill which can transmit water.

### 3.4.2.3 Discharge

Discharge from the consolidated rocks within the study area is primarily by springs, wells, and upward leakage to the unconsolidated valley fill. Several springs discharge from the Thaynes Formation at higher altitudes, but only one major spring, Dority Spring, has substantial discharge in the valley. Provided the Park Meadows well is not used, the flow from Dority spring may vary from about 0.5 to 2 cubic feet per second. Two wells are completed in consolidated rocks in the study area, but only the Park Meadows well, completed in the Thaynes Formation, is used when other sources for the municipal system do not provide enough water to meet demand. Discharge from the Park Meadows well may be as much as 1,200 gallons per minute. Due to low transmissivity and storage in the Woodside Shale and thus low yield, the Pacific Bridge well is not used as a source of municipal water.

### 3.4.2.4 Seasonal Water-Level Fluctuations

Seasonal fluctuations in the consolidated-rock aquifers are related to recharge at high altitudes and hydraulic properties of the rocks. Water-level fluctuations in the Pacific Bridge well, completed in the Woodside Shale, are quite large. Data collected during this study show a seasonal change of 14 feet, and data reported by Holmes, Thompson, and Enright (1986, p. 65) show a seasonal change of almost 23 feet. In contrast, seasonal fluctuations in the Park Meadows well completed in the Thaynes Formation are small. Water-level data collected by Holmes, Thompson, and Enright (1986, p. 65) indicate a seasonal variation of slightly more than three feet at a time when the Park Meadows well was not being used for municipal water.

### 3.4.2.5 Hydraulic Properties

Previously reported transmissivity values for the Thaynes Formation (Holmes, Thompson, and Enright; 1986, p. 67), which are based on aquifer tests, ranged from 2,400 to 7,400 feet squared per day. They reported that the transmissivity differences are due to the magnitude and number of fractures and solution openings rather than the inherent primary permeability of the rock. Additional transmissivity values for rocks in the Prospector Square area include 360 feet squared per day for the Weber Quartzite, 280 feet squared per day for the Woodside Shale, 200 feet squared per day for the Nugget Sandstone, and three to 73 feet squared per day for the Tertiary extrusive igneous rocks (Holmes, Thompson, Enright; 1986, p. 67). No aquifer test data are available for the Ankareh Formation and the Park City Formation. Due to the lack of peripheral observation wells during the tests mentioned above, values for storage could not be determined.

## <u>4.0 FIELD ACTIVITIES</u>

### 4.1 DRILLING

Drilling was done in two phases. Phase I took place in July 1987 with the installation of two deep and eleven shallow monitoring wells. These wells were monitored to study the water quality at the site. Phase II drilling was done in January and February 1988 to install 5 deep wells. Phase II wells were drilled as part of an interference (pump) test which is discussed in section 5.0 of this report. Drilling activities reports are included in Attachment A.

## 4.2 SLUG TESTS

The USGS performed slug tests to calculate hydraulic conductivities. The results of these test are listed in Table 4 and are described in Section 3.4.1.5. of this report.

## 4.3 SAMPLE COLLECTION

The overall scope of the investigation involved the collection of 13 groundwater samples, 2 drain samples 5 surface water samples, 4 sediment samples, and 8 tailings samples. Tailings samples were collected during July-August 1987. Groundwater samples were collected in September 1987, December 1987, February 1988 and April 1988. Surface water/sediment samples were collected during April 1987, July 1987 and April 1988. Samples were collected at various intervals to observe possible seasonal variations in the water quality.

An approved work plan, sampling plan and health and safety plan was submitted to EPA and Park City on May 18, 1987. Performance evaluation, rinsate blank, field blank and duplicate samples were submitted to the laboratory with each set of samples. Additionally, each sample was split between the State of Utah, U.S. EPA and the U.S. Geological Survey. The State of Utah samples were analyzed by the State Health Laboratory, Salt Lake City, Utah. The U.S. EPA samples were analyzed by various contract laboratories, and the U.S. Geological survey samples were analyzed by the USGS Laboratory, Denver, Colorado.

Les Springer, U.S. EPA Environmental Services Division, conducted a field audit during the first round of groundwater sampling. He indicated that samples were being collected in accordance with the sampling plan and data obtained from these samples should be legally defensible. His report is included in Attachment B.

### 4.3.1 Ground-Water Samples

Ground-water samples for chemical analysis were collected on four separate occasions after the installation of the monitoring-well network. The first sampling occurred at the end of August and beginning of September 1987 before groundwater levels had begun the seasonal decline (fig. 5). Subsequent samplings took place at the beginning of December 1987, the end of February 1988, and the middle of April 1988. The two rounds of sampling during the winter occurred while groundwater levels were at a minimum; and the April sampling occurred while the overall groundwater levels were near their yearly highs.

The groundwater sampling procedure involved several specific tasks. Water-level measurements were made to determine the amount of water within the well casing. Three to five casing volumes of water subsequently were pumped from the well. During the first round of sampling, all purged water was contained pending the results of the chemical analyses. Temperature, pH, and specific conductance were measured at all sites during each sampling round. During the first round of sampling, alkalinity was determined and compared to values of alkalinity determined in the lab. Both values compared favorably for water from all wells and, therefore, field alkalinity determinations were eliminated during the remaining rounds. Filtered samples were collected to determine concentrations of dissolved constituents. Unfiltered samples were collected for alkalinity, cyanide, chloride, and sulfate. The U.S. Geological Survey lab uses filtered water for chloride and sulfate determinations. In contrast, the State lab and the EPA contract labs use unfiltered water for these constituents. Monitoring well PS-MW-1s (background) was not sampled during the third round due to flooding from melting snow.

Large pH values in water from two monitoring wells, wells PS-MW-13 and PS-MW-14, indicated that the grout used in well installation moved around the bentonite seal and impregnated the sand pack. Therefore, these wells were not sampled to determine the quality of water due to the uncertainity of the results.

#### 4.3.2 Surface Water/Sediment Samples

Five surface water sampling sites were established to monitor the quality of surface water above and below the tailings site. On both Silver Creek and the Pace-Homer Ditch, a site was located above and below the tailings site with the fifth site located downstream from the point where water from the Pace-Homer Ditch can be diverted into Silver Creek. Samples were collected at high, medium, and low flows for the period of the project. However, below-normal snowpack for the last two years has resulted in below normal runoff, and the flows observed during this study are probably not representative of long-term average flows.

During the sampling procedure, both filtered and unfiltered samples were collected for the analysis of dissolved and total constituents. Grab samples were taken rather than an integrated sample due to the small cross-sectional area of flow in the streams. Sediment samples also were collected from the banks of the streams at the surface water-air contact at the same time. Field measurements of stream discharge, temperature, specific conductance, pH, and alkalinity were measured at each sampling site (Table 5).

#### 4.3.3 Tailings Characterization

Mill tailings were deposited in the Prospector Square area beginning in the early 1900's and continuing through the 1930's. Subsequently, in the 1940's, the mill tailings were reworked using an in-situ extraction process for the recovery of residual silver. The present sporadic occurrence of the mill tailings as shown by test-drilling during this study is a direct result of the reworking process. Tailings were encountered in three of the nine wells completed in the immediate mill tailings area. Tailings from wells PS-MW-3 and PS-MW-5 appeared to have been reworked and had the appearance of well-sorted, fine- to medium-grained, brown sand. In contrast, the tailings from well PS-MW-9 did not appear to have been reworked due to the presence of sphalerite and various forms of pyrite. The thickness of each tailings interval encountered is listed in table 1. Chemical analyses from a total metal extraction are listed in table 10. Ecology and Environment, Inc., the Field Investigation Team contracted by the EPA, has estimated the volume of mill tailings to be 46,740 cubic yards using an average tailings thickness of five feet and an area of 45 acres. However, this estimate may be considered high because tailings were only encountered in three of the nine monitoring wells during drilling.

## 5.0 AQUIFER INTERFERENCE TEST

As part of this study, an interference test was completed to determine the possible effects of pumping the municipal Park Meadows well on the water levels in the unconsolidated valley-fill deposits overlying the Thaynes Formation and in the adjoining tailings area. The primary question to be addressed was whether water in the unconsolidated valley fill underlying the Silver Creek Tailings site could move toward and into the Thaynes Formation and possibly contaminate the water withdrawn from the Park Meadows well.

To help answer these questions, an aquifer interference test was designed that involved pumping the Park Meadows well for 72 hours followed by 72 hours of recovery. To help determine effects on water levels near the Park Meadows well, two additional monitoring wells, located between the tailings area and the Park Meadows well, were drilled and completed near the base of the unconsolidated valley fill. In addition, three monitoring wells were completed at depths of 95, 138, and 85 feet in the unconsolidated valley fill underlying the tailings area. These five wells, plus the original 13 monitoring wells, the Pacific Bridge well, the Cartier well, Dority Spring pond and weir, and Pace Homer Ditch staff and flume were monitored during the test (fig. 2a, 2b). Water levels were measured in all wells for seven days prior to the test to establish water-level trends. Wells PS-MW-1d, PS-MW-13, and PS-MW-14 were equipped with pressure transducers and data-loggers to give continous readings of water levels. Additional recorders were used to measure gage height at Dority Spring pond and discharge at Dority Spring weir continually. All other wells and the Pace-Homer Ditch staff gage and flume were measured every two hours during the first 12 hours of the test, every four hours for the next 24 hours, and approximately every 12 hours for the reamining 36 hours. All recorders were operated for several days after the pump was shut off, and periodic measurements were made at the other data collection sites.

No major problems occured during the test. The pump maintained a discharge rate of approximately 1200 gallons per minute during the test except when the pump shut down for approximately two hours after about 45 hours of pumping. The water level in the Park Meadows well recovered slightly (Attachment E); but no effects were seen at other wells. Weather conditions were ideal throughout the test with no warm temperatures causing excessive melting of snow which could have made it difficult to determine some of the effects on the streams in the area.

Water levels measured before, during, and after the pumping period (Attachment E) show that water levels in the Cartier Well and wells PS-MW-13 and PS-MW-14 were definitely affected by the pumping of the Park Meadows well. The greatest decline, about five feet, was recorded at well PS-MW-13. The water level in wells PS-MW-14 declined about two feet as did the level in the Cartier well which went dry on the second day of the test and remained dry for approximately 48 hours after pumping ceased.

Similar to the effects of previous interference tests, the pond at Dority Spring went dry and discharge ceased during the 72 hour test. Due to pumping of the Park Meadows Well, the water level in the Thaynes Formation was lowered such that discharge from the spring ceased after approximately 48 hours. About 24 hours elapsed after the pump was turned off before discharge from the spring resumed. Measured spring discharge at the weir, about 150 feet downstream from the pond, resumed more than 72 hours before water began appearing in the pond due to an underground pipe which intercepts some discharge underneath the pond and delivers it to the channel downstream.

Water-level changes in the Pacific Bridge Well and well PS-MW-1d were due to changes in barometric pressure. Fluctuations in barometric pressure are plotted inversely (increase in pressure downward) on graphs which show both water-level change and barometric pressure (Fig. 6). Therefore, if water-level change was a function of barometric pressure, both curves should follow the same trend. This is very evident in the combined plot for the Pacific Bridge Well.

To observe any effects in the Pace-Homer Ditch due to the pumping, both a staff gage near well PS-MW-11 and a Parshall flume were monitored throughout the test. During the test, the water level in the Pace-Homer Ditch declined by 0.14 feet as measured at the staff gage. Flow in the Pace-Homer Ditch declined by 0.6 cubic feet per second, of which about 0.4 cubic feet per second was due to the elimination of discharge from Dority Spring. The remaining 0.2 cubic feet per second possibly may be due to a decrease in discharge from the unconsolidated valley fill and the Thaynes Formation into the Pace-Homer Ditch.

Wells PS-MW-9, located in the City Park at the lower end of the Prospector Square area, was affected during the test. Due to its close proximity to the Pace-Homer Ditch, water-level changes in this well are directly a result of decreased flow in the ditch. This relation is shown graphically in the plot which compares water level in PS-MW-9 to gage height as measured at the staff gage in the Pace-Homer Ditch.

Small fluctuations in PS-MW-1s, PS-MW-1d, PS-MW-2, PS-MW-3, PS-MW-4, PS-MW-7d, and PS-MW-11d may have been due to pumping of the Park Meadows well or changes in recharge due to surface runoff of melting snowpack prior to the test and the lack of runoff during the test, or a combination of the two, but data were insufficient to identify the specific causes.

Effects due to pumping of the Park Meadows well appear to be limited to the unconsolidated valley fill overlying the Thaynes Formation. Observation wells located in Prospector Square are completed in the unconsolidated valley fill overlying the Woodside Shale and apparently are not affected by the pumping. Therefore, the pumping of the Park Meadows well does not cause water-level declines in the Woodside Shale and the overlying unconsolidated valley fill. Water-level declines in the unconsolidated valley fill above the Thaynes Formation are not sufficiently large to cause an effect in the unconsolidated valley fill overlying the Woodside Shale.

## 6.0 ANALYTICAL RESULTS

The results of analyses are shown in Tables 5 through 9. Samples were analyzed for Hazardous Substance Metals. Samples collected by EPA were sent to the Contract Laboratory Program (CLP) for analyses. Samples collected by the State of Utah were sent to the State Health Laboratory (SHL), Salt Lake City, Utah. The U.S.G.S. collected a selected number of samples, and these samples were sent to the U.S.G.S. laboratory in Denver, Colorado.

## 7.0 QUALITY ASSURANCE

The following steps were taken regarding the date quality assurance.

1. A detailed sampling plan (with input and consent from all parties) was prepared and followed during the field activities.

2. U. S. EPA Region VIII, Environmental Services Division conducted a field audit during the first round of groundwater sampling and concluded that the date collected during this investigation should be valid and defensible.

3. Field blanks, decontamination blanks and duplicate samples (as specified in the sampling plan) were collected for each round of sampling. A brief discussion of these results is given below. Data validation summaries stating spike recoveries, duplicate sample results and other quality control criteria are included in Attachment I.

### 7.1 GROUNDWATER

#### 7.1.1 Round I

A duplicate sample was collected from MW-12. SHL analyses show relative percent differences (RPDs) less than 20% for each parameter except for iron and zinc. CLP data show RPD less than 20% for each parameter except for calcium, magnesium, manganese, potassium, and sodium. No contamination was found in the field blank and decontamination blank analyzed by the SHL and CLP. CLP data for barium, lead, selenium, silver and vanadium were partially qualified but usable.

#### 7.1.2 Round II

A duplicate sample was collected from MW-9. SHL analyses show RPD less than 20% for each parameter. CLP data show RPD less then 20% for each parameter except for arsenic, iron, and sodium. CLP and SHL did not detect any contamination in field blank and decontamination blank. All the contaminants levels in the blanks were at or below their detection limit. A performance evaluation sample was submitted to CLP. Results for the performance evaluation sample were within the 95% confidence interval except for nickel, vanadium and zinc. All values reported by the SHL are within the 95% confidence interval.

Some cadmium data analyzed by the SHL did not match closely with the CLP and USGS lab and was flagged with a star (*). CLP data were partially qualified but useable.

#### 7.1.3 Round III

A duplicate sample was collected from MW11. SHL analyses show RPD less than 20% for each parameter except for iron and zinc. CLP data show RPD less than 20% for each parameter except for cadmium, copper, lead, and mercury. SHL did not detect any contamination in the rinsate blank except for iron and zinc. A slightly higher value than the detection limit for cadmium was detected in the rinsate blank analyzed by the CLP. All values reported by the CLP for the performance evaluation sample were within the 95% confidence interval except for lead, mercury, nickel and vanadium. CLP data were partially qualified but useable.

7.1.4 Round IV

A duplicate sample was collected from MW11D. SHL analysis show RPD less then 20% for each parameters. CLP analysis indicate RPD less than 20% for each parameter. CLP and SHL did not detect any contamination in the field blank and decontamination blank. All the contaminant levels in the blanks were at or below the detection limit. Two performance evaluation samples (low range and high range) were submitted to SHL and CLP. SHL and CLP reported most values within the 95% confidence interval.

7.2 SURFACE WATER/SEDIMENT

Surface water/sediment samples were collected for three rounds. Surface water samples were analyzed for total and dissolved metals. The last round of surface water/sediment samples were collected in conjunction with the last round of groundwater samples. RPD's for duplicate samples were within 20% with a few exception and no contamination was found in the blanks.

## 8.0 DISCUSSION OF ANALYTICAL RESULTS

The objectives of this section are (1) to summarize the analytical results for the samples collected during groundwater, surface water, sediment and soil sampling and (2) to determine whether hazardous substances have been released from the site to the environment.

8.1 WASTE CHARACTERIZATION

Mill tailings were deposited in the Prospector Square area beginning in the early 1900's and continuing through the 1930's. Subsequently, in the 1940's, the mill tailings were reworked using an in-situ extraction process for the recovery of residual silver. The sporadic occurrence of the mill tailings as shown by test-drilling during this study is a direct result of the reworking process. Tailings were encountered in three of the nine monitoring wells completed in the immediate mill tailings area as shown in figure 2a. However, due to the reworking process, tailings may be present out of the original tailings pond area and the outline shown in figure 2a should be considered as the minimal areal extent. Tailings from monitoring wells PS-MW-3 and PS-MW-5 appeared to have been reworked and had the appearance of well-sorted, fine-to medium-grained, brown sand. In contrast, the tailings from monitoring well PS-MW-9 did not appear to have been reworked based on the presence of sphalerite and various forms of pyrite. The thickness of each tailings interval encountered is listed in table 1. Chemical analyses from a total metal extraction are listed in table 10. Ecology and Environmet, Inc., the Field Investigation Team contracted by the U.S. Environmental Protection Agency, has estimated the volume of mill tailings to be 46, 740 cubic yards using an average thickness of 5 feet. Due to the sporadic deposits of tailings, the assumed average thicknedd may be too large, thus, resulting in an overestimate for the tailings volume.

8.2 GROUNDWATER DATA

Chemical analyses of the water collected from the monitoring wells and drains indicate that the concentrations of major ions vary areally and vertically within the unconsolidated valley fill (Table 9). In water from most of the monitoring wells and drains, the prevalent ions were calcium and sulfate, except in a dew wells where sodium and chloride predominated as shown in the trilinear diagram (Fig. 7). In water from monitoring well PS-MW-1s, the concentration of sodium was similar to the concentration of calcium, and the concentration of chloride was much greater then the concentration of sulfate. As expected, the specific conductance of the water in this well was large due to dissolved-solids concentration. The anomalous dissolved-solids concentration in water from this well compared to water from other wells in the Prospector Square area may be due to the storage of snow removed from city streets at this location. Road salt contained in the snow probably dissolved as the snow melted in the spring and the resulting melt water containing large concentrations of sodium and chloride infiltrated into the unconsolidated valley fill.

Water from monitoring well PS-MW-1d, which is next to monitoring well PS-MW-1s, also had a chloride concentration in excess of that of sulfate, but the concentrations similar to those in water from monitoring well PS-MW-1d were detected in water from monitoring well PS-MW-2, and concentrations similar to those in water from monitoring well PS-MW-1s were detected in water from PS-MW-3, but to a lesser degree. Monitoring well PS-MW-3 is located adjacent to Kearns Boulevard and water in this well also may be affected by the infiltration of water containing sodium and chloride from road salt. The monitoring wells that were completed near the base of the unconsolidated valley fill, with the exception of well PS-MW-1d, generally yield water with low specific conductance values and wells PS-MW-5d, PS-MW-7d, PS-MW-11d, and PS-MW-12. The water from monitoring well PS-MW-5d, similar to that from wells completed in the shallow unconsolidated valley fill, has calcium and sulfate as the most prevalent ions, but in lower concentrations. The water from monitoring wells PS-MW-7d and PS-MW-11d had calcium and bicarbonate as the mose prevalent ions. The presence of bicarbonate and sulfate as the most prevalent ions. The low dissolved-solids concentrations in water derived from the base of the unconsolidated valley fill beneach the Silver Creek Tailings Site may indicate that ground water in the shallow unconsolidated valley fill does not sppear to move downward even though the hydraulic gradient is downward. If water from the shallow unconsolidated valley fill is moving downward, then the quantity of water is probably small and it is diluted at depth.

Concentrations greater than background levels for dissolved zinc were detected in water from six monitoring wells and one drain, and concentrations greater then background levels for dissolved manganese were detected in water from three monitoring wells and both drains. The dissolved-zinc concentration in water from monitoring wells PS-MW-4, PS-MW-5, and PS-MW-10 varied seasonally with the largest concentrations coinciding with high groundwater levels. The dissolved manganese concentration in water from monitoring wells PS-MW-4, PS-MW-5, and PS-MW-10 and drain PD-DR-2 also varied seasonally, but, unlike zinc, the highest concentrations coincided with the lowest ground-water levels. However, the dissolved-manganese concentration in water from monitoring well PS-MW-10 followed the same pattern as that for dissolved zinc with the highest concentration coinciding with high ground-water levels. The high dissolved-zinc concentrations may be related to the influx of water during the spring months with slightly low pH and more dissolved oxygen. Zinc may be more soluble under these conditions. In contrast, the high dissolved-manganese concentrations may be related to reducing conditions during the winter months, which coincide with low ground-water levels. This is evident in water from drain PS-DR-2, where the concentrations of iron and manganese were high in December 1987.

## 8.3 STATISTICAL EVALUATION

Four rounds of ground water samples were collected during September and December 1987 and February and April 1988. The analytical results were reviewed, and questionable data points identified and flagged. Inspection of the data indicated that for most metal parameters the downgradient water quality is comparable to the upgradient water quality. Arsenic, Cadmium, chromium, manganese, and zinc, however, exhibited some differences in concentrations between upgradient and downgradient locations. Statistical testing was performed only for those parameters to determine whether the differences were significant.

For each of the parameters, comparison was made betweem the combined values from the upgradient or background wells and the combined values for all downgradient wells for each round of sampling and for each agency's data seperately. Questionable data was not used in the calculations and where data was reported as less than a particular detection limit value, one-half of the value and less than detection limit values as such were employed to perform the calculations.

The wells which were considered upgradient or background consisted of MW 1S, 1D, 12. The wells which were grouped to form the downgradient population include MW 2, 3, 4, 5, 6, 7, 8, 9 and 11. During Rounds 3 and 4, MW 5D, 7D, and 11D were also included in the downgradient group. Well PS-MW-10 which is located on Silver Maple Claim Property (another CERCLA site) and Drains 1 and 2 were sampled for informational purposes, but were not included in the statistical evaluation.

Cochran's approximation for the Behrens-Fisher Students t-test at the 95 percent confidence level was the statistical methodology employed to make comparisons between concentrations in the upgradient versus downgradient groups of wells. This method was selected because of the small sample size, and it's use in the Resource Conservation and Recovery Act (RCRA) program for the last 8 years to assess similar situations.

During Round 3, one of the upgradient wells (MW 1S) could not be sampled because of flooding problems and the lack of this date prevented any statistical testing during this round. In addition, questionable data, which was not used in the statistical evaluations, or lack of data prevented comparisons being made with particular agency data during other rounds. No statistically significant increases over background levels were found in any of the data sets for arsenic and chromium.

For cadmium, statistically significant increases over background were calculated in Round 1, (USGS and EPA data; insufficient State data), and Round 2, (EPA data; insufficient State and USGS data). As noted, Round 3 data could not be evaluated. Neither the State nor the EPA data (USGS data was insufficient) indicated a significant increase in Round 4. The significant increases over background for cadmium seem to be largely due to the contribution from MW8 where concentrations ranged from 14 to 20 ug/l. This is the only well in which any valid cadmium concentrations exceed the primary drinking water standard of 10 ug/l.

Statistically significant increases over background for manganese were calculated in round 2 and 4 (State and EPA data; insufficient USGS data). The major contributors to this increase appear to be MW9 with concentrations of 1,300 to 1,500 ug/l and MW4 with concentrations of 1,800 to 2,250 ug/l during Round 2. Most of the downgradient and many of the upgradient manganese values during all sampling rounds are in excess of the secondary drinking water standard of 50 ug/l. This is not a health-based standard but rather is based upon the staining properties of manganese which may be manifest at this and higher concentrations.

The zinc data showed statistical increases over background during Round 1 (all three data sets), and Round 2 and 4 (State and EPA data; USGS data insufficient). Wells MW 4, 5, 6, 7 and 8 were those which had the largest increases over background with individual values in the 2,000 to 3,000 ug/l range. However, it should be noted that even the highest value detected, 3,210 ug/l, is still well below the secondary drinking water standard of 5,000 ug/l.

## 8.4 SURFACE-WATER SEDIMENT DATA

The quality of water in the Silver Creek drainage is quite different from that of water in the Pace-Homer Ditch, reflecting the different origins of the water. Water in Silver Creek upstream from the point where water from the Pace-Homer Ditch can enter Silver Creek has a larger specific conductance than the water in the ditch. Similarly, pH in Silver Creek generally is greater; however, the alkalinity is less than in the Pace-Homer Ditch. The major ions appear to be different for the stream and ditch (Table 6); but this may not necessarily be true. During high flows in the spring, the major ions in Silver Creek are sodium and chloride, but during low-flows in the summer, the major ions are calcium and sulfate. THe presence of sodium and chloride in the spring may be due to surface runoff of water containing dissolved road salt. In the Pace-Homer Ditch, the major ions are calcium and sulfate regardless of the volume of flow.

The water at the sampling site on Silver Creek downstream from Prospector Square (Fig. 2b) consists of water from several sources, and generally reflects the water chemistry of the primary source at the time of sampling. During surface-water sampling in April 1987 and in April 1988, both Silver Creek and the Pace-Homer Ditch contributed water for the combined site. As expected, specific conductance, pH, and alkalinity were less during both April samplings than during the low flow sampling in July 1987, when Silver Creek was dry downstream from Wyatt Earp Drive.

Chemical analyses of filtered water collected from surface-water sites indicated that concentrations of dissolved cadium, manganese, and zinc were greater than background concentrations only during low-flow conditions (Table 6). Concentrations of dissolved cadmium, manganese, and zinc that were greater than background were not detected during low flow at the upstream site on Silver Creek at Bonzana Drive; but the water collected during low flow from Silver creek at Wyatt Earp Drive had concentrations of dissolved manganese and zinc that were about 10 times greater than concentrations measured during average or high flow. Similarly, the dissolved-cadmium concentration at this site was about 15 micrograms per liter at low flow; whereas, only about 2 micrograms per liter cadmium was detected during high flow.

Water collected at the site on Silver Creek downstream from Prospector Square also had concentrations of dissolved manganese and zinc that were greater than background concentrations along with a detectable concentration of dissolved cadmium during low flow; however, the concentrations were less than those at the site at Wyatt Earp Drive. As mentioned above, Silver Creek was dry downstream from Wyatt Earp Drive, and the primary source for the water at the site on Silver Creek downstream from Prospector Square appears to have been drain PS-DR-1. Similar values of specific conductance and alkalinity along with similar values of specific conductance and alkalinity along with similar concentrations of dissolved cadmium, manganese, and zinc in water at the site on Silver Creek downstream from Prospector Square and in water from drain PS-DR-1 support the conclusion that little or no water was being contributed by flow in the Pace-Homer Ditch.

Despite more than 2 cubic feet per second of flow in the Pace-Homer Ditch, practically all of this water continued down the ditch with only a small quantity leaking into Silver Creek. Therefore, in July 1987, water at the site on Silver Creek downstream from Prospector Square appears to be from drain PS-DR-1, which discharges into Silver Creek downstream from the City Park.

Chemical analyses of unfiltered water collected at the surface-water sites have concentrations (table 7) similar to those detected in the filtered water (table 6). The only substantial differences are the much greater concentrations of total iron and lead in unfiltered samples collected at the three sites along Silver Creek. During the first round os surface-water sampling in April 1987, total-iron and total-lead concentrations were largest at the upstream site at Bonzana Drive and decreased downstream. The concentrations of these constituents also decreased in subsequent rounds of sampling at all sites on Silver creek. Therefore, the suspended iron and lead in the water appears to be due to a disturbance of surficial deposits upstream prior to the first round of sampling, which was not repeated prior to later rounds of sampling.

Chemical analyses of stream sediment are presented in table 8. Varying concentrations of all selected metals were present, with the largest concentrations being totel-recoverable iron, lead, manganses, and zinc. No distinct pattern among sites and sampling rounds is apparent. Sediment from the site on the Pace-Homer Ditch downstream from Prospector Square had concentrations similar to the sites on Silver Creek, indicating that the ditch, like Silver Creek, is probably cut through tailings.

## 9.0 TARGETS

### 9.1 GROUNDWATER ROUTE

Park City draws it municipal water from mine tunnels and the Park Meadows well. The Park Meadows well is located within a 3-mile radius from the site and is completed in the Thaynes Formation. The Pacific Bridge well is the only well located on site but it is no longer in use. The residents of Prospector Square receive their drinking water from the Park City Public water supply system. The Cartier well (a shallow hand dug well) is also located within a 3-mile radius from the site, but it is not currently being used for drinking water purposes.

The aquifer of concern in this area is the Thaynes Formation, in which the Park Meadows well is located. Based on current hydrologic conditions, groundwater underlying the tailings area does not appear to be moving towards the Park Meadows well. Therefore, it appears that there is no target population for the groundwater route.

### 9.2 SURFACE WATER ROUTE

The Silver Maple Claim Property (another CERCLA site) is located downstream of Prospector Square adjacent to its eastern boundary. Silver Creek flows through the Silver Maple Claim site after it exits the Prospector Square area. Silver Creek then flows east about two miles to Richardson Flat (an NPL site). Currently there are no known uses of Silver Creek between Prospector Square and Richardson Flat. The target population for the surface water route appears to be minimum to non-existent.

## 10.0 CONCLUSIONS

Based on the date collected, the following conclusions may be drawn from the study:

### 10.1 TAILINGS CHARACTERIZATION

1. It is estimated that 46,740 cubic yards of tailings are present on site.

2. The tailings contain elevated levels of arsenic, cadmium, chromium, iron, lead, manganese, zinc and other metals as shown in Table 10.

### 10.2 GROUNDWATER

1. The ground water sampling data were collected for four rounds (September, 1987; December, 1987; February, 1988; and April, 1988). Samples were split among USGS, EPA and State of Utah. Data indicate a statistically significant release for zinc for each round of sampling. Some data also indicate statistically significant releases for cadmium and manganese. However, these releases (cadmium and manganese) were not observed during each round and were not supported by all data. Downgradient water quality appears to be comparable to the background for all metals except zinc, cadium, and manganese.

2. The primary drinking water standards were met for all parameters in all wells except well PS-MW-8 (downgradient) which exceeded the standard for cadmium. The secondary drinking water standard for iron was met in all upgradient locations, but was exceeded in PS-MW-9.

3. The interference test (pump test) results show that water levels in the onsite monitoring wells (except MW-9 which is influenced by the flow of Pace Homer Ditch) were not significantly impacted by the pumping of the Park Meadows Well. Based on the present hydrologic conditions in the unconsolidated valley fill such as hydraulic gradient, horizontal and vertical hydraulic conductivities, and the present distribution of ground-water withdrawal from the consolidated

rocks, water underlying the tailings area does not appear to be moving toward the Park Meadows Well (see section 3.4 of text).

## 10.3 SURFACE WATER

1. The downstream surface water quality for Silver Creek is comparable to background except for cadmium, manganese, and zinc in both filtered and unfiltered samples. During the second round of sampling, ten fold increases in concentrations of these metals were observed downstream as compared to upstream samples. However, due to the lack of an adequate number of samples, it can not be determined if a statistically significant release has occurred. The surface water quality in Pace-Homer Ditch is comparable in both upstream and downstream locations for filtered and unfiltered samples.

2. The primary drinking water standard for cadmium was exceeded at the downstream location on Silver Creek for the filtered and unfiltered samples.

3. The Silver Creek is classified as 3A, 1C, and 4 by the State of Utah. Cadmium levels during the second round of sampling downstream on Silver Creek were elevated compared to the 3A, 1C, and 4 classification standards. However, the classification standards are extablished for a one hour composite sample, and during the sampling activity for this study only grab samples were collected.

## 11.0 RECOMMENDATIONS

1. Data collected during the groundwater investigation indicate that the tailings in the Prospector Square area are affecting groundwater quality in the unconsolidated valley fill. However, under current hydrologic conditions, groundwater in the Prospector Square area does not appear to be moving toward the Park Meadows Well. In addition, groundwater analyses in the Prospector Square area indicate that drinking water standards were exceeded only in well PS-MW-8.

   It is therefore recommended that future groundwater development in the area be closely monitored to ensure that existing groundwater sources are not adversely impacted by migration of groundwater from the Prospector Square area into usable water sources. In addition, groundwater development in the unconsolidated valley fill underlying Prospector Square should be prohibited. It also is recommended that existing geohydrologic relationships be monitored to ensure that conditions do not change in a manner that will result in migration of contaminated groundwater into useable groundwater sources.

2. Data collected during the surface water investigation indicate that the tailings in the Prospector Square area are affecting the water quality of Silver Creek, and that the drinking water standard for cadmium is exceeded in Silver Creek near the eastern side of Prospector Square. In addition, Silver Creek is classified as 3A, 1C and 4 by the Utah Bureau of Water Pollution Control and the data indicates that cadmium standards for these classifications may also be exceeded. Therefore, action should be taken that will eliminate contact between Silver Creek and the tailings material.

## ACKNOWLEDGEMENT

Sections 3.2, 3.3, 3.4, 4.3.1, 4.3.2, 4.3.3, 5.0, 8.1, and 8.2 of this report were prepared by the U.S. Geological Survey. Drilling reports were prepared by Ecology and Environment, Inc. (Field Investigation Team).

## REFERENCES

Bouwer, H. and Rice, R. C., 1976, A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells: Water Resources Research, vol. 12 no. 3, p. 423-428.

Broomfield, C. S., and Crittenden, M. D., Jr., 1971, Geologic map of the Park City East quadrangle, Summit and Wasatch Counties, Utah: U.S. Geological survey Geological Quadrangle Map GQ-852, scale 1:24,000.

Chow, V. T., 1964, Handbook of applied hydrology: McGraw-Hill, New York.

Cooper, H. H., Jr., Bredehoeft, J. D., and Papadopulos, I. S., 1967, Response of a finite-diameter well to an instantaneous charge of water: Water Resources Research vol. 3, no.1, p. 263-269.

Crittenden, M. D., Jr., Calkins, F. C., and Sharp, B. J., 1966, Geologic map of the Park City West quadrangle, Utah: U.S. Geological Survey Geological Quadrangle Map GQ-535, scale 1:24,000.

Fenneman, N. M., 1931, Physiography of the Western United States: New York, N.Y., NcGraw-Hill, 534 p.

Holmes, W. F., Thompson, K. R., and Enright, M., 1986, Water resources of the Park City area, Utah with emphasis on ground water: Utah Department of Natural Resources Technical Publication No. 85, 81 p.

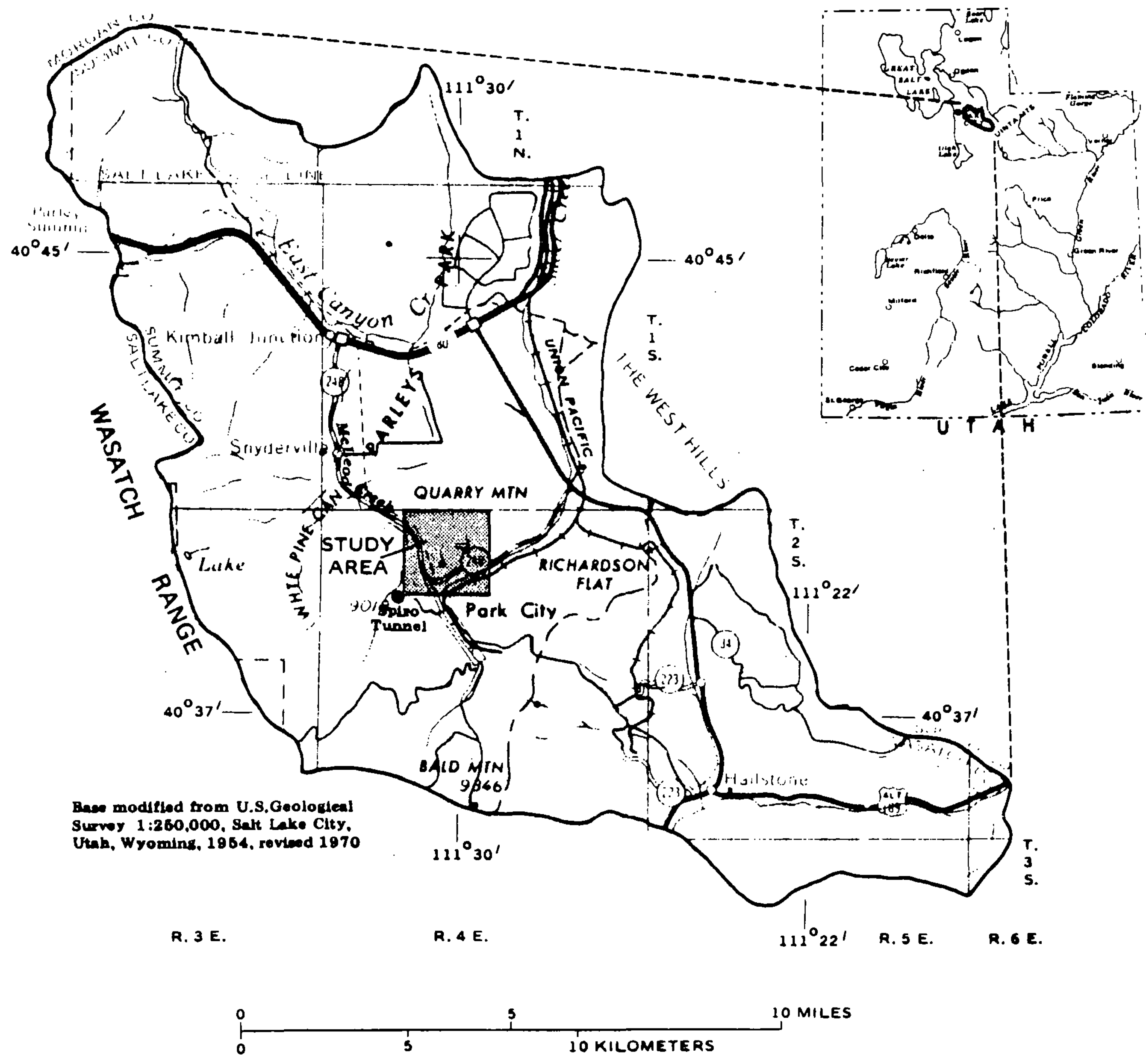



Figure 1.--Location of study area.

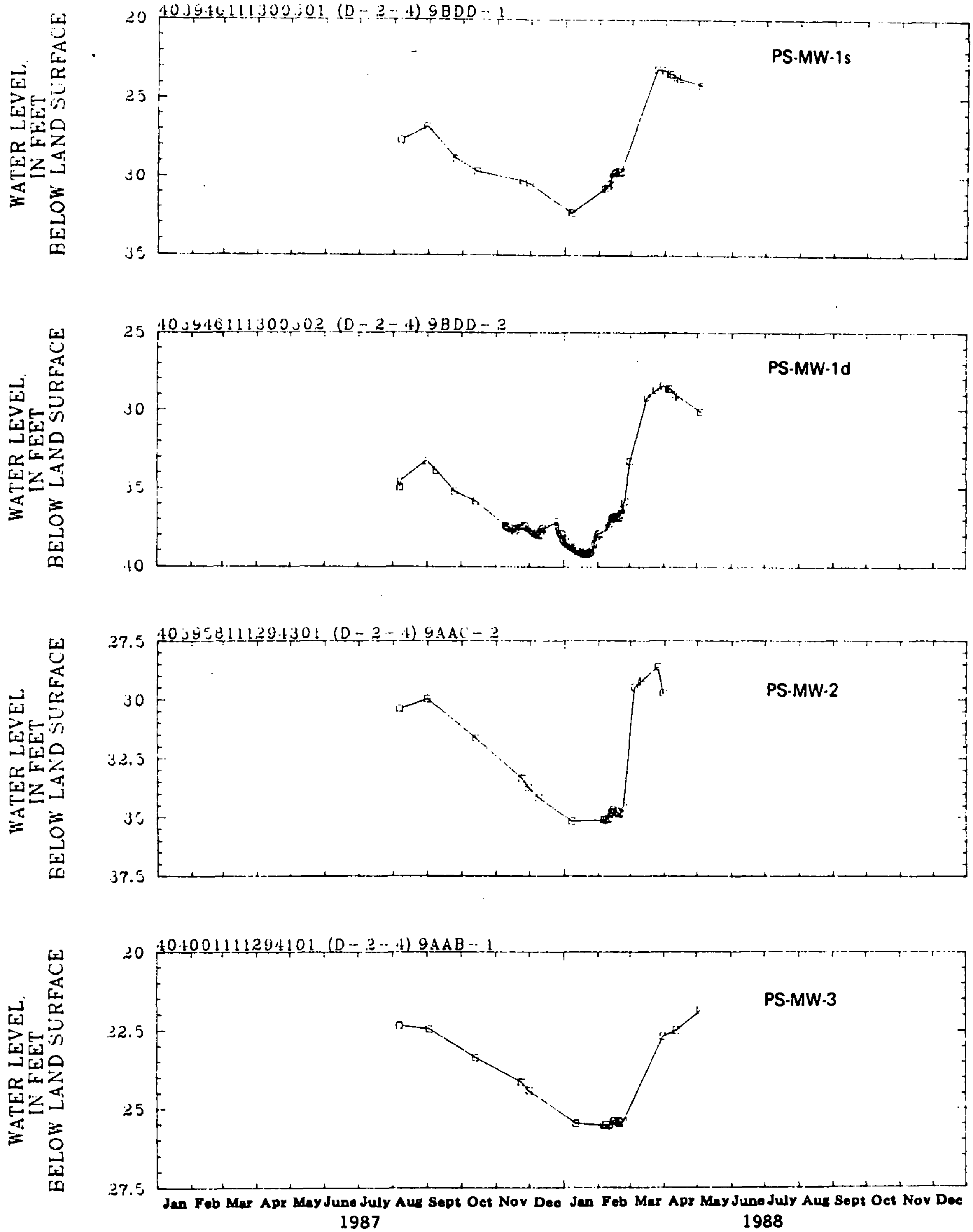



Figure 5.--Seasonal water-level fluctuations in observation wells.

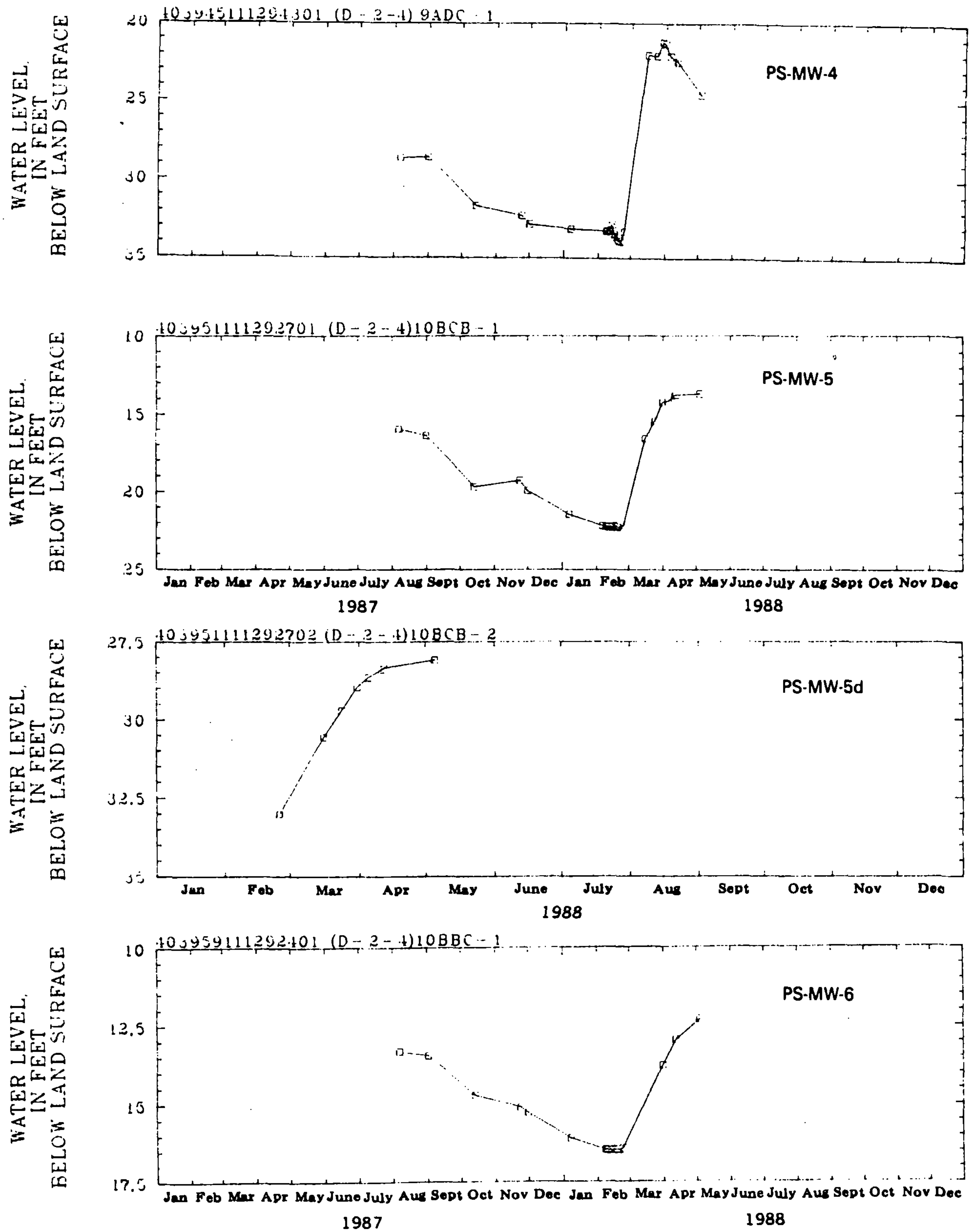



Figure 5.--Seasonal water-level fluctuations in observation wells--Continued.

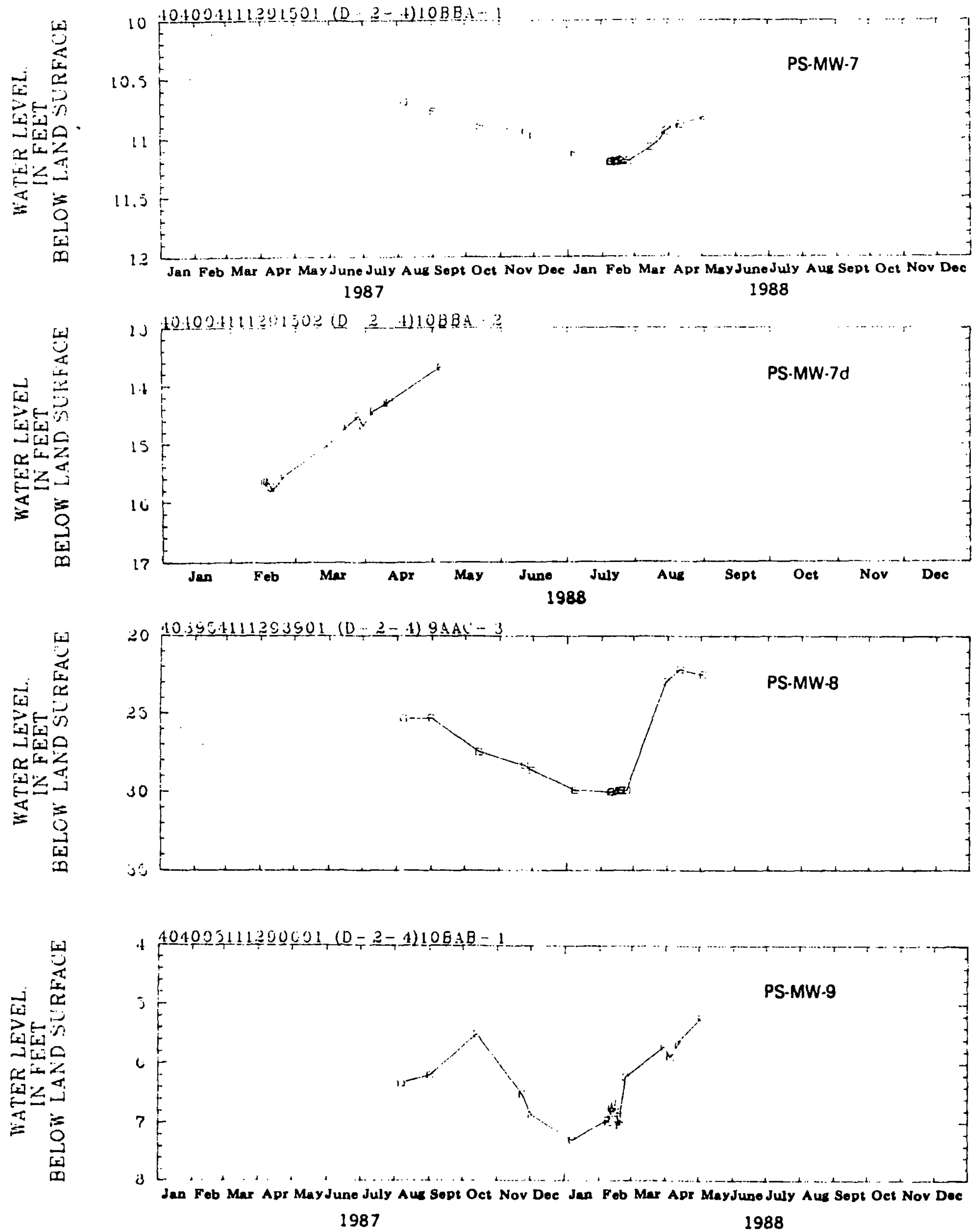


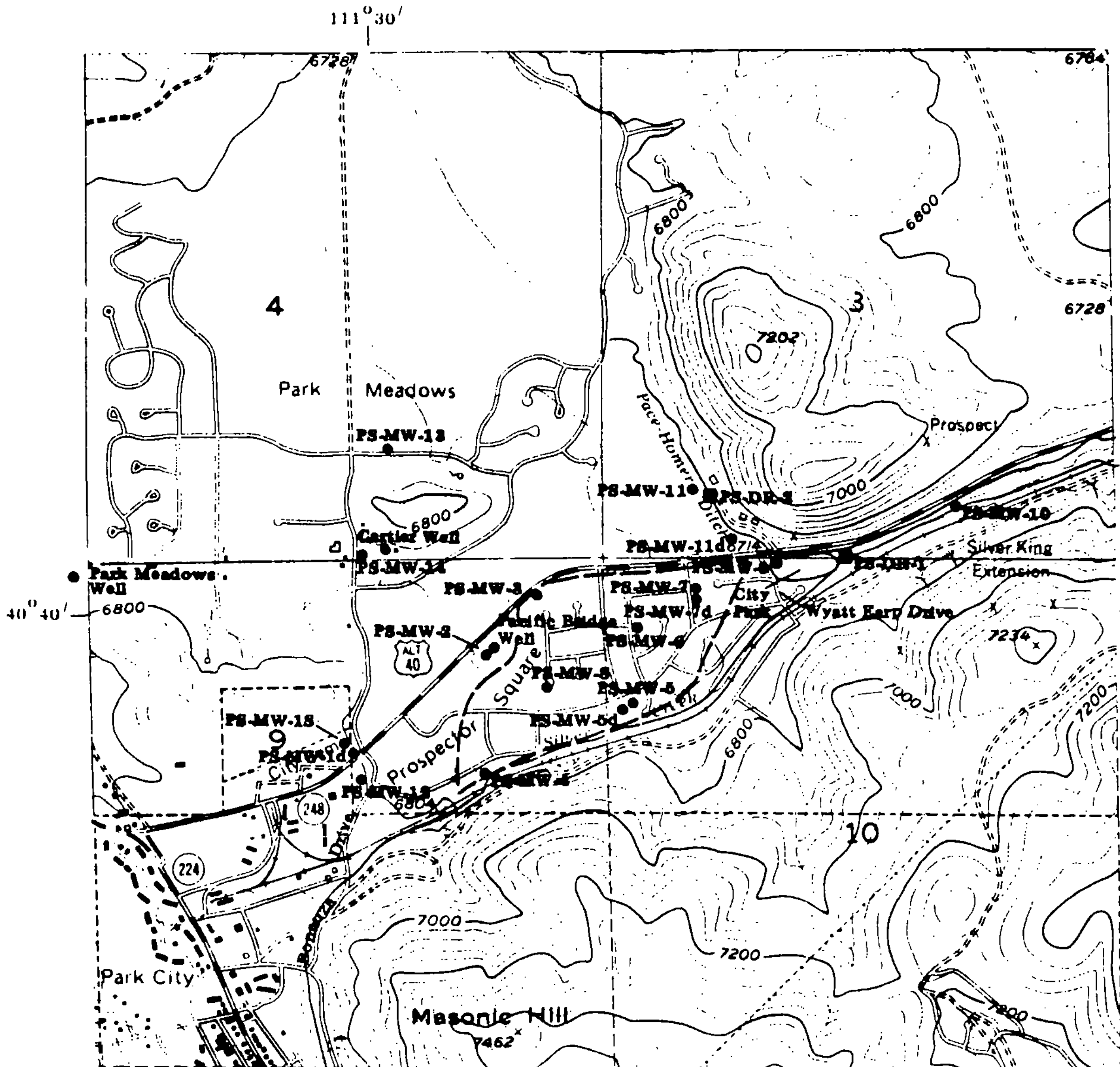

Figure 5.--Seasonal water-level fluctuations in observation wells--Continued.

EXPLANATION

• WELL

■ DRAIN

— — — TAILINGS POND--As shown on U.S. Geological Survey Park City East, 1:24,000, 1955




Base from U.S. Geological Survey Park City West, 1:24,000, 1955, revised 1975 and Park City East, 1:24,000, 1955

0 1/4 1/2 3/4 1 MILE

0 1/4 1/2 3/4 1 KILOMETER

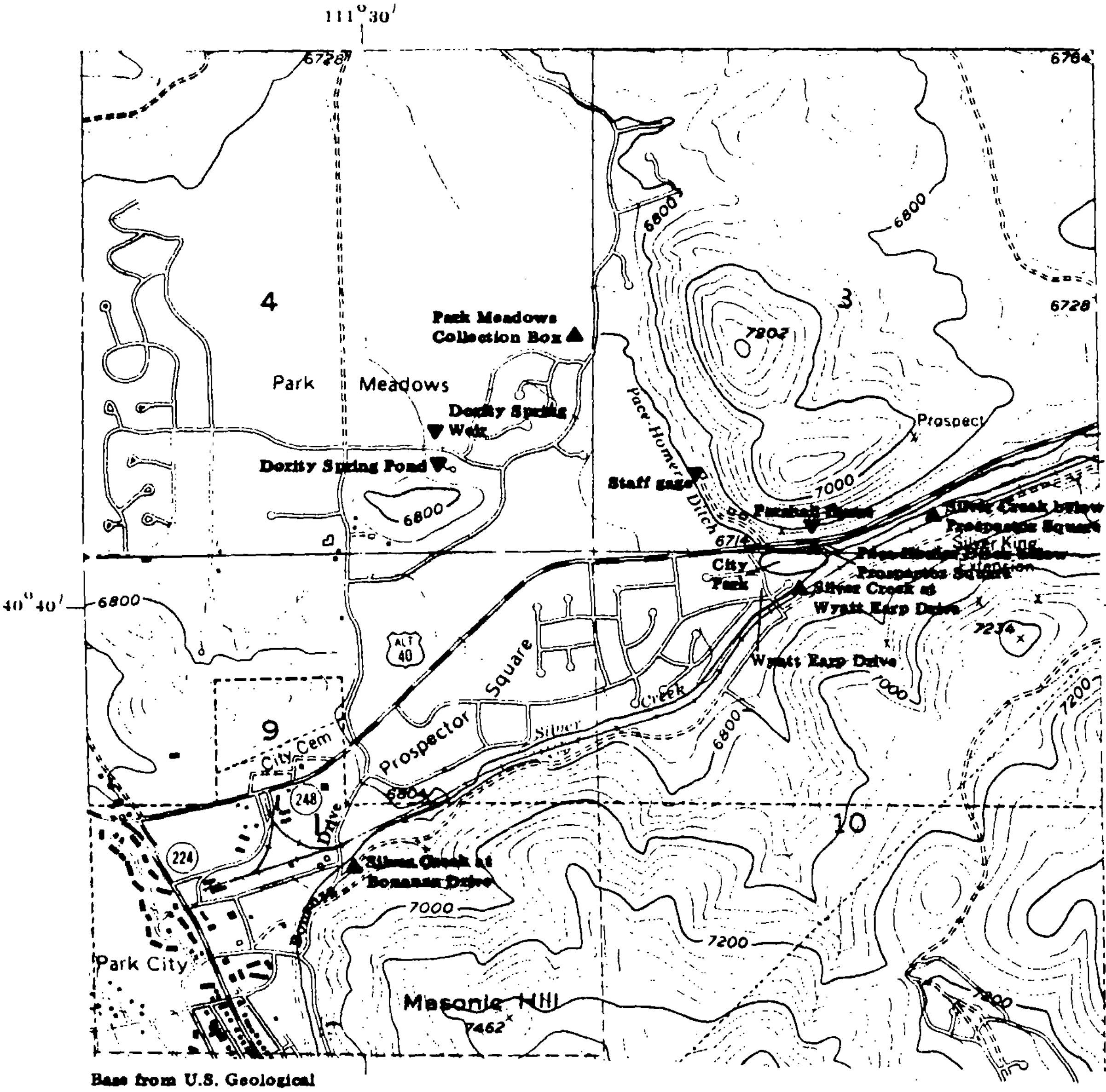
CONTOUR INTERVAL 40 FEET
DATUM IS SEA LEVEL

Figure 2a.--Location of ground-water sites in Prospector Square area, Summit County, Utah.

EXPLANATION

▲ WATER-QUALITY DATA-COLLECTION SITE

▼ AQUIFER-INTERFERENCE TEST DATA-COLLECTION SITE



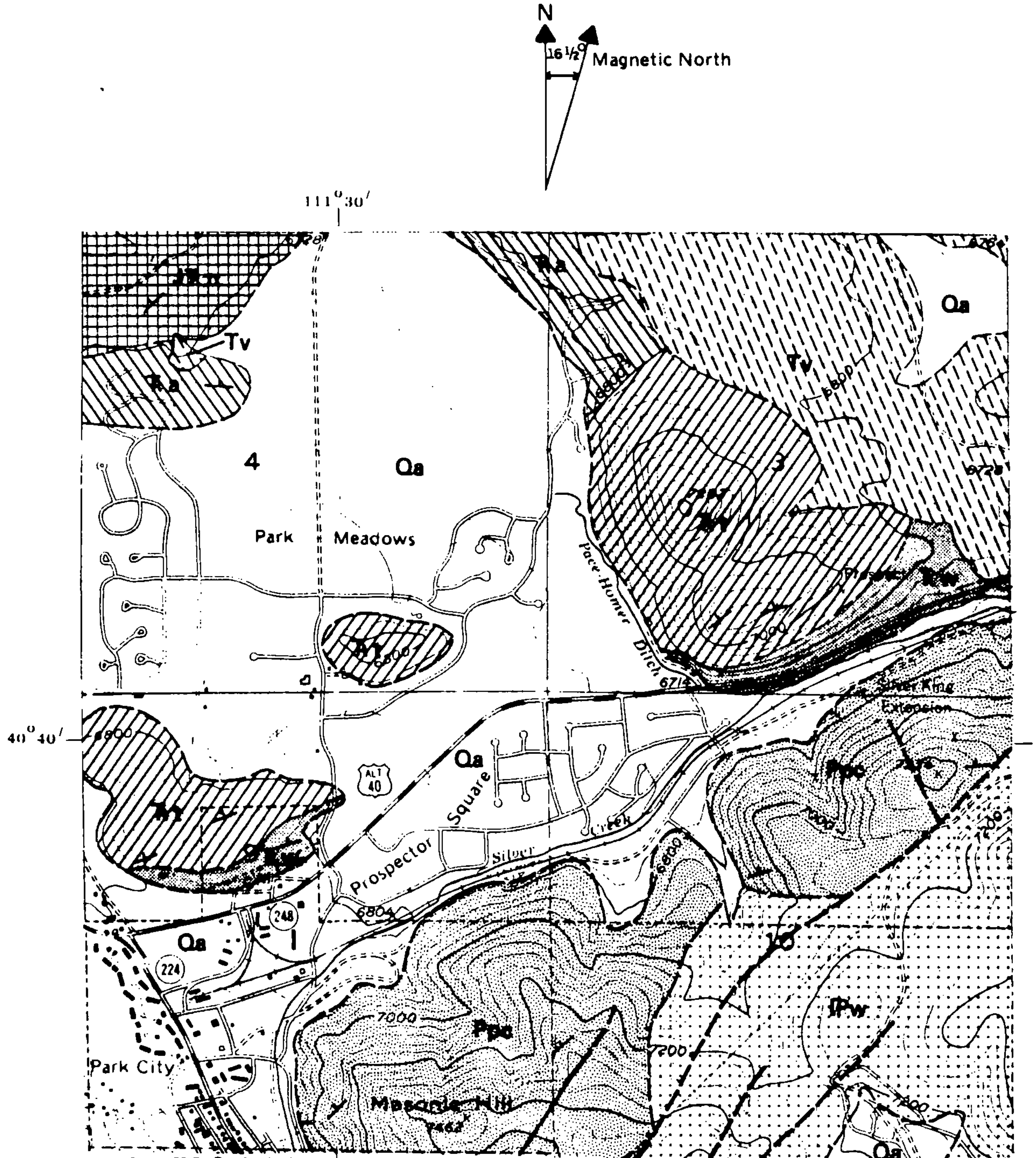

Base from U.S. Geological Survey Park City West, 1:24,000, 1955, revised 1975 and Park City East, 1:24,000, 1955

0 ¼ ½ ¾ 1 MILE

0 ¼ ½ ¾ 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS SEA LEVEL

Figure 2b.--Location of surface-water data-collection sites in Prospector Square area, Summit County, Utah.




Base from U.S. Geological Survey Park City West, 1:24,000, 1955, revised 1975 and Park City East, 1:24,000, 1955

0 1/4 1/2 3/4 1 MILE

0 1/4 1/2 3/4 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS SEA LEVEL

Geology modified from Crittenden and others (1966); and Broomfield and Crittenden (1971)

Figure 3.--Generalized geology of the Prospector Square area, Summit County, Utah.

## EXPLANATION

| | | |
|---|---|---|
| QUATERNARY | Qa | ALLUVIAL DEPOSITS--Poorly sorted mixture of material ranging in size from clay to boulders. Beds appear to be lenticular and discontinuous |
| TERTIARY | Tv | IGNEOUS ROCKS--Primarily extrusive igneous rocks, chiefly andesitic pyroclastics with some intercalated flow rocks |
| JURASSIC | Jn | NUGGET SANDSTONE--Pale-orange, medium-grained, cross-bedded sandstone |
| TRIASSIC | TRa | ANKAREH FORMATION--Reddish-brown, reddish-purple, or bright-red shale, mudstone, and sandstone in upper and lower parts. Massive, cross-bedded, white to pale-purple, coarse-grained to pebbly quartzite in middle part |
| | TRt | THAYNES FORMATION--Brown-stained, fine-grained limy sandstone and siltstone interbedded with olive-green to dull-red shale and gray, fine-grained, fossiliferous limestone |
| | TRw | WOODSIDE SHALE--Dark-red or purplish-red shale |
| PERMIAN | Ppc | PARK CITY FORMATION--Pale-gray-weathering fossiliferous and cherty limestone containing a medial phosphatic shale member |
| PENNSYLVANIAN | IPw | WEBER QUARTZITE--Pale-gray, tan-weathering quartzite and limy sandstone with some interbedded gray to white limestone and dolomite |

CONTACT--Dashed where approximately located

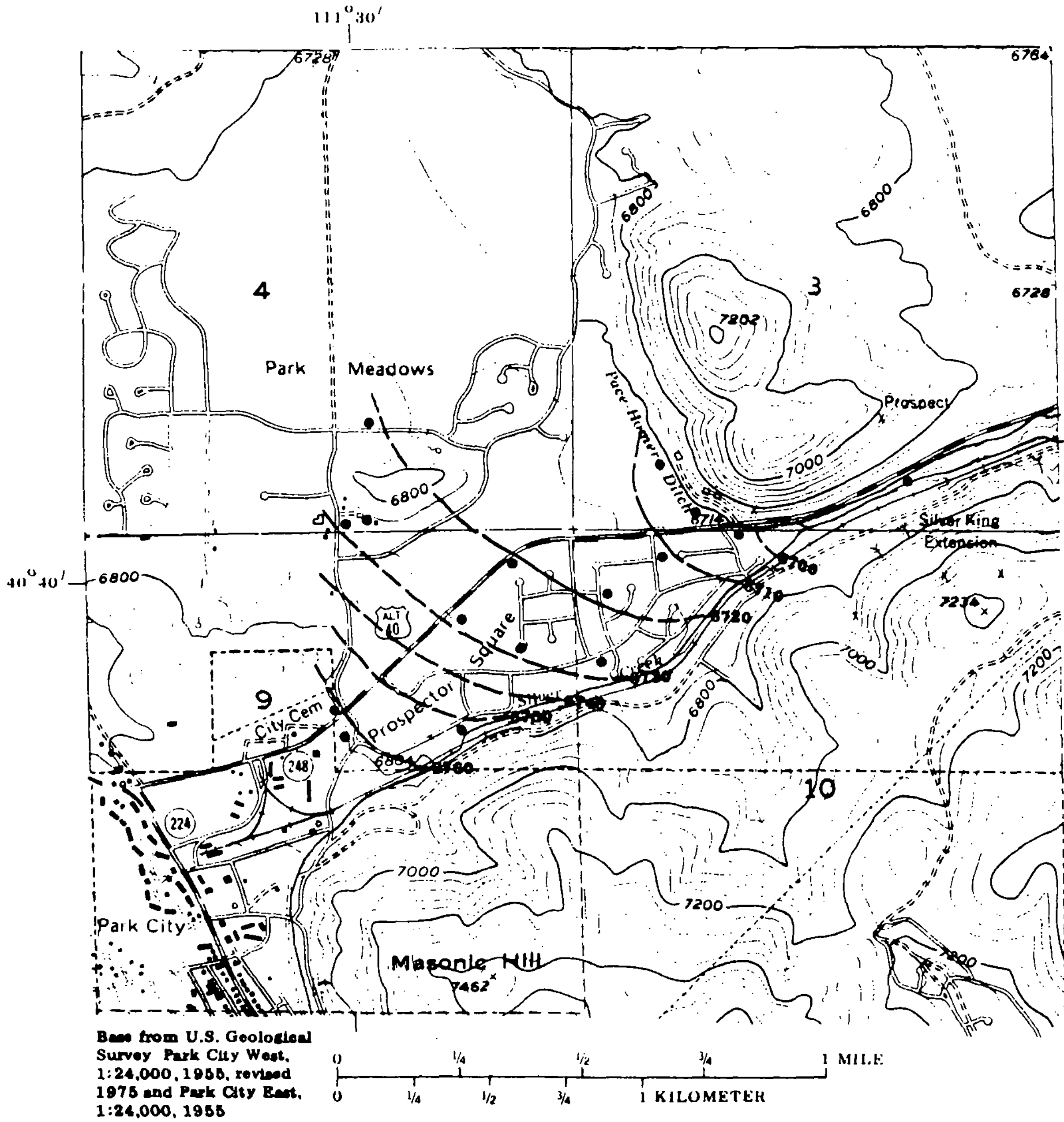
HIGH-ANGLE FAULT--Dashed where approximately located

STRIKE AND DIRECTION OF DIP OF BEDS

## EXPLANATION

——6760——— WATER-TABLE CONTOUR—Shows altitude of the water table. Dashed where approximately located. Contour interval 10 feet. Datum is sea level

● OBSERVATION WELL




CONTOUR INTERVAL 40 FEET
DATUM IS SEA LEVEL

Figure 4.--Map of the Prospector Square area showing the water table in the shallow unconsolidated valley-fill aquifer, April 1988.

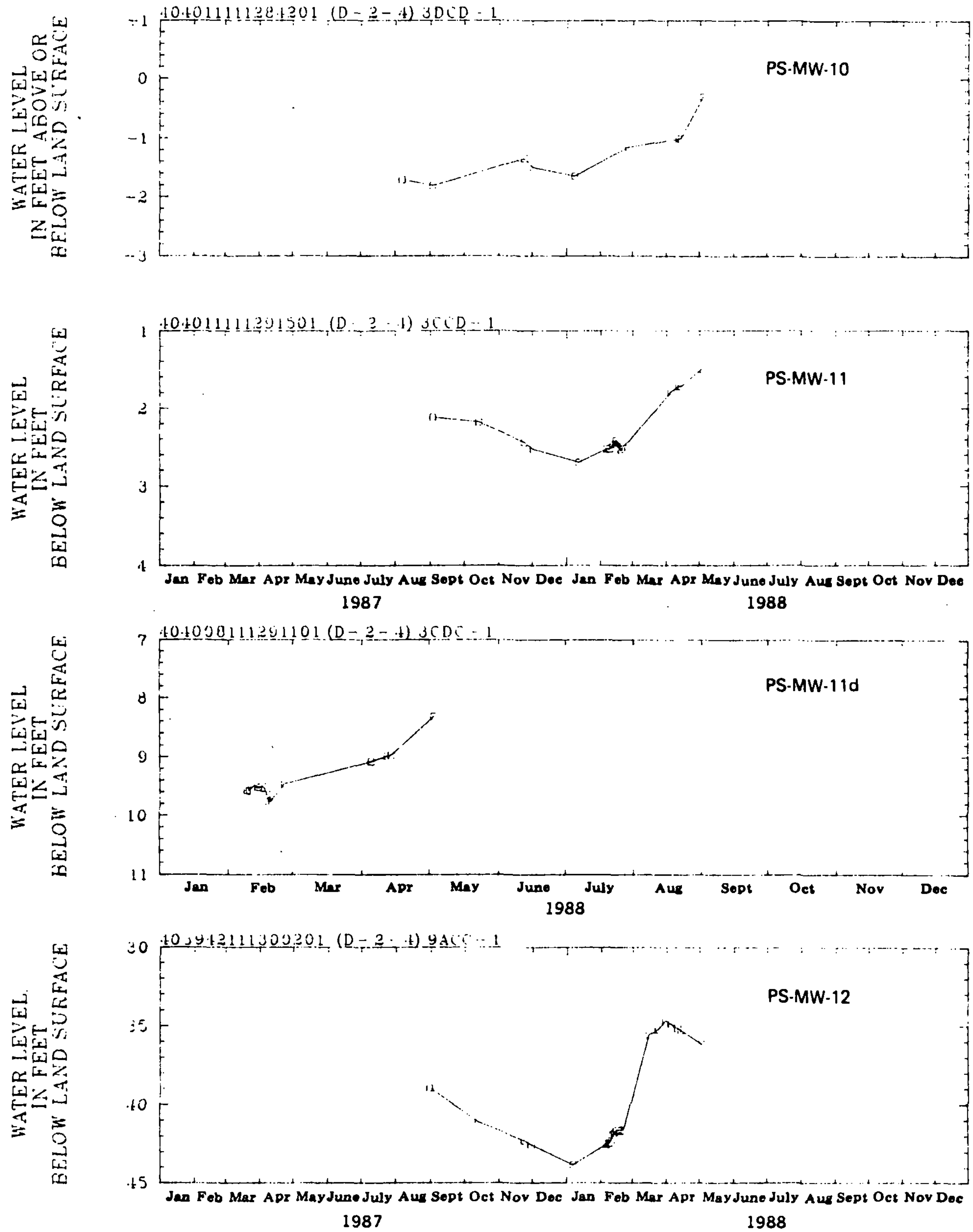



Figure 5.--Seasonal water-level fluctuations in observation wells--Continued.

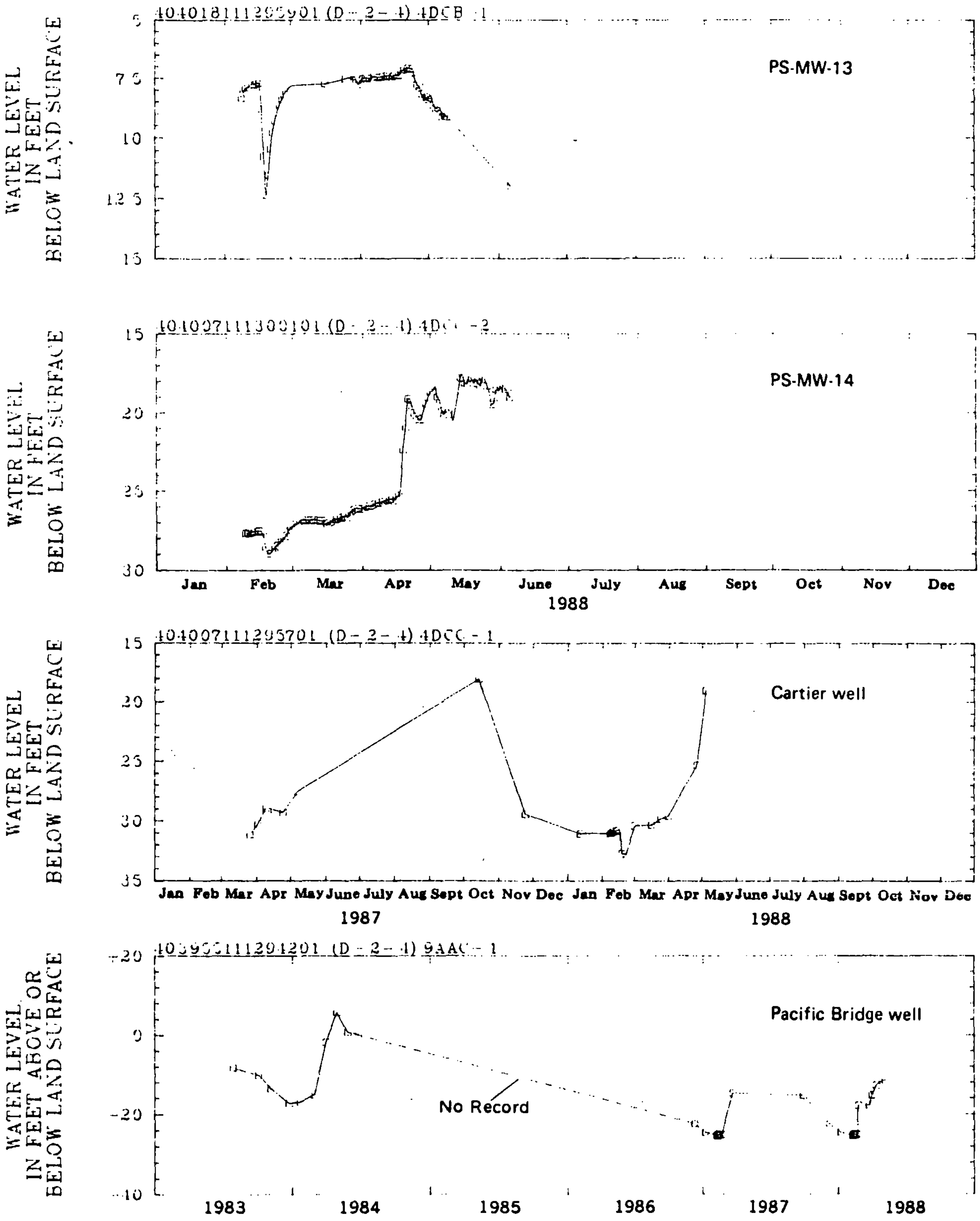



Figure 5.--Seasonal water-level fluctuations in observation wells--Continued.

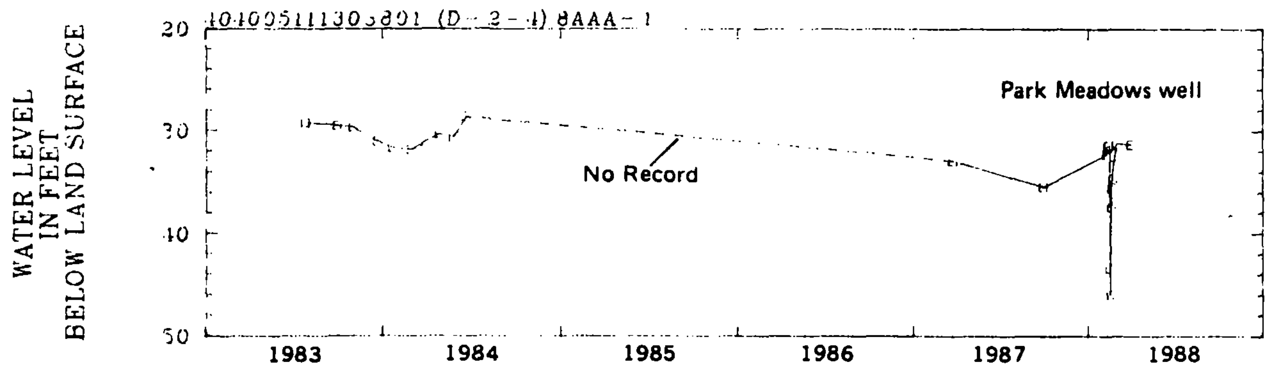
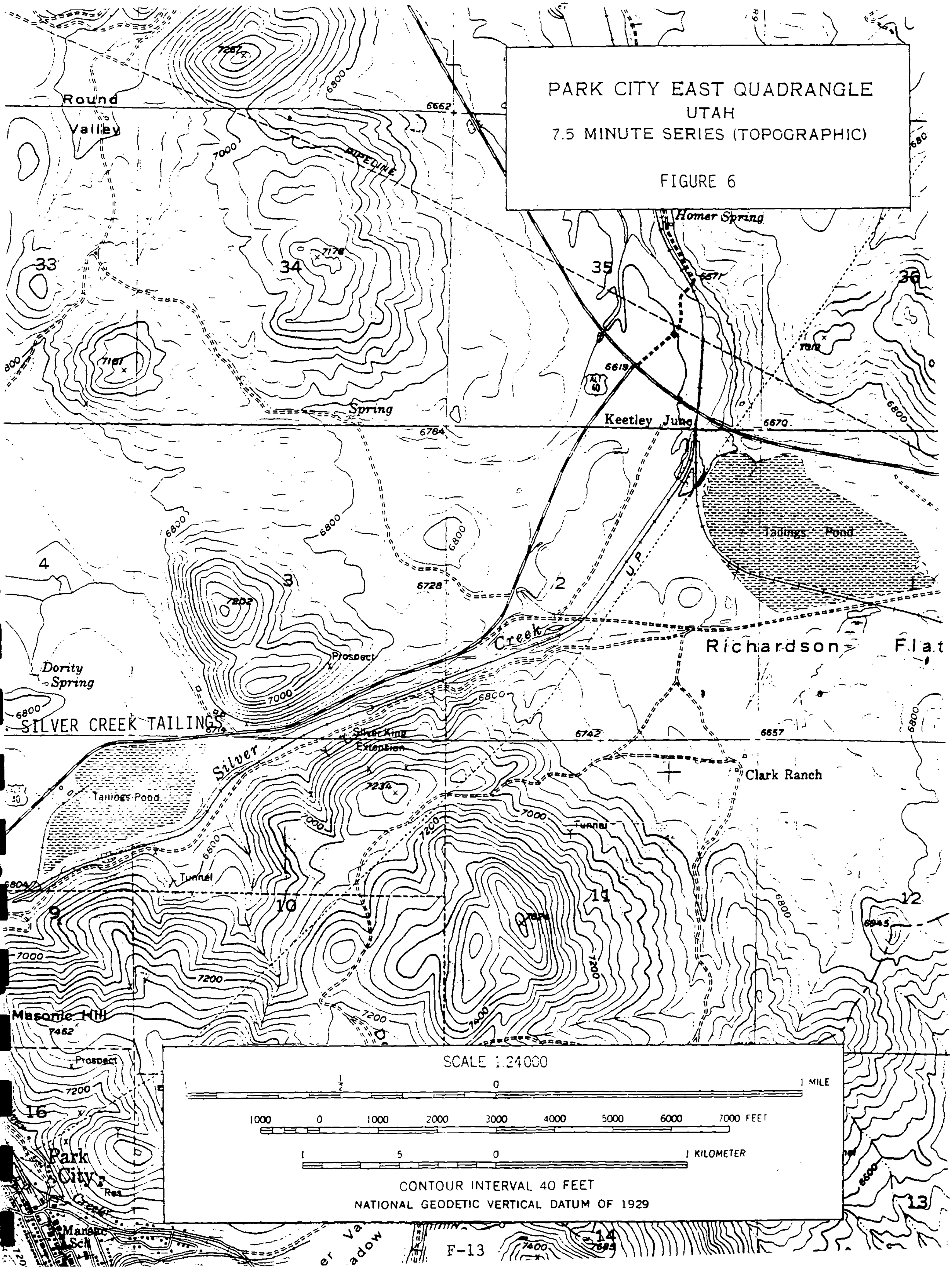



Figure 5.--Seasonal water-level fluctuations in observation wells--Continued.


PARK CITY EAST QUADRANGLE
UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)
FIGURE 6
Round Valley
Homer Spring
Spring
Keetley Junc
Tailings Pond
Richardson Flat
Dority Spring
SILVER CREEK TAILINGS
Silver Creek
Silver King Extension
Prospect
Clark Ranch
Tunnel
Masonic Hill
Park City
Res
SCALE 1:24000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

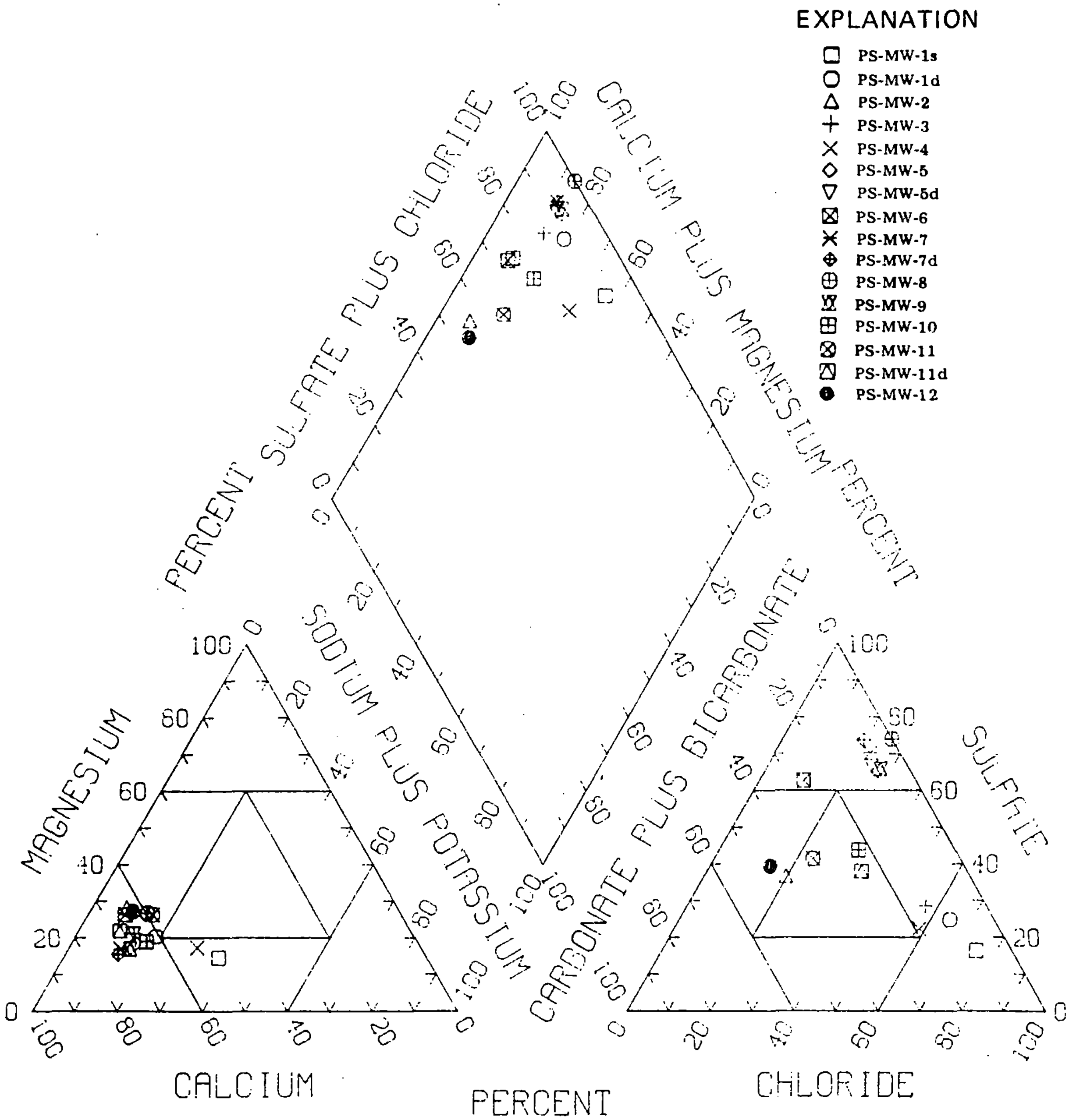



Figure 7.--Chemical composition of water from monitoring wells completed in the unconsolidated valley fill.

Table 1.--Selected data for 3 observation wells and 18 monitoring wells

Altitude of land surface: Surveyed altitudes given in feet and decimal fractions; altitudes interpolated from U.S. Geological Survey topographic maps given to nearest foot.
Screened interval: Upper and lower limits of screen given in feet below land surface, P indicates perforated casing.
Production interval: Upper and lower limits of the well that are open to the aquifer material, given in feet below land surface.
Principal water-bearing unit: Trt, Thaynes Formation; Trw, Woodside Shale; Qa, unconsolidated valley fill.
Tailings interval: Upper and lower limits of tailings given in feet below land surface.
Other available data: C, water-quality data in table 9; L, lithologic logs in table 2; and W, water-level data in table 3.

| Well identfier | Depth of borehole (feet) | Altitude of land surface (feet) | Screened interval (feet) | Production interval (feet) | Principal water-yielding unit | Tailings interval (feet) | Other available data |
|---|---|---|---|---|---|---|---|
| | | | OBSERVATION WELLS | | | | |
| Park Meadows Well | 320 | 6,751.75 | 100-113(P) | [1]100-165 | Trt | -- | L,W |
| Pacific Bridge Well | 446 | 6,759.73 | 300-446(P) | 300-446 | Trw | -- | L,W |
| Cartier Well | 33 | 6,750.22 | -- | -- | Qa | -- | L,W |
| | | | MONITORING WELLS | | | | |
| PS-MW-1s | 47.0 | 6,791.87 | 35.0-40.0 | 32.5-45.5 | Qa | -- | C,L,W |
| PS-MW-1d | 85.5 | 6,791.06 | 70.0-80.0 | 62.0-80.0 | Qa | -- | C,L,W |
| PS-MW-2 | 44.5 | 6,758.44 | 33.0-38.0 | 29.0-44.5 | Qa | -- | C,L,W |
| PS-MW-3 | 36.0 | 6,743.35 | 25.5-30.5 | 19.0-35.5 | Qa | 1.0-2.0 | C,L,W |
| PS-MW-4 | 45.0 | 6,773.42 | 34.0-39.0 | 17.0-45.0 | Qa | -- | C,L,W |
| PS-MW-5 | 33.0 | 6,741.04 | 23.0-28.0 | 20.0-33.0 | Qa | 0.6-1.4<br>4.5-9.0 | C,L,W |
| PS-MW-5d | 95.5 | 6,741.99 | 83.0-93.0 | 81.0-95.0 | Qa | do | C,L,W |
| PS-MW-6 | 29.0 | 6,731.48 | 19.0-24.0 | 14.0-29.0 | Qa | -- | C,L,W |
| PS-MW-7 | 25.5 | 6,722.46 | 15.5-20.5 | 11.5-25.5 | Qa | -- | C,L,W |
| PS-MW-7d | 138.0 | 6,722.59 | 120.0-130 | 116.0-134.0 | Qa | -- | C,L,W |
| PS-MW-8 | 40.5 | 6,751.41 | 28.5-33.5 | 19.5-40.0 | Qa | -- | C,L,W |
| PS-MW-9 | 16.5 | 6,707.90 | 8.5-13.5 | 5.0-15.5 | Qa | 1.5-2.0<br>2.4-3.5 | C,L,W |
| PS-MW-10 | 13.0 | 6,680 | 6.0-11.0 | 4.9-11.5 | Qa | -- | C,L,W |
| PS-MW-11 | 21.5 | 6,711.19 | 10.0-15.0 | 3.5-20.0 | Qa | -- | C,L,W |
| PS-MW-11d | 85.0 | 6,715.89 | 69.8-79.8 | 66.0-79.8 | Qa | -- | C,L,W |
| PS-MW-12 | 125 | 6,797.70 | 110.0-120.0 | 98.5-120.0 | Qa | -- | C,L,W |
| PS-MW-13 | 61.0 | 6,728.42 | 41.0-51.0 | 38.0-52.0 | Qa | -- | C,L,W |
| PS-MW-14 | 75.0 | -- | 48.5-58.5 | 43.0-63.5 | Qa | -- | C,L,W |

[1] Although the completed well was originally 300 feet deep, a recent televiewer log shows that the borehole wall has caved in the uncased part of the well below a depth of 113 feet.

Table 2.--Lithologic logs of 2 observation wells and 18 monitoring wells

Altitude of land surface: Alt., in feet above sea level.
Thickness in feet.
Depth in feet below land surface.

| Location and material | Thickness | Depth |
|---|---|---|
| OBSERVATION WELLS | | |
| Park Meadows Well | | |
| (D-2-4) 8aaa-1 | | |
| Alt. 6,51.75 feet. | | |
| Log by Dave's Drilling | | |
| Clay.......................... | 10 | 10 |
| Sand and gravel................ | 30 | 40 |
| Clay.......................... | 10 | 50 |
| Sand and gravel................ | 10 | 60 |
| Clay.......................... | 10 | 70 |
| Sand and gravel................ | 10 | 80 |
| Cobbles....................... | 10 | 90 |
| Shale, reddish................ | 40 | 130 |
| Shale, reddish, mixed with limestone, gray.............. | 50 | 180 |
| Limestone, gray, mixed with shale, reddish............... | 40 | 220 |
| Limestone, gray............... | 80 | 300 |
| Unknown....................... | 20 | 320 |
| Pacific Bridge Well | | |
| (D-2-4)9aac-1 | | |
| Alt. 6,758.53 feet. | | |
| Log by Larry W. Dalton | | |
| Sand and gravel................ | 5 | 5 |
| Sand.......................... | 4 | 9 |
| Clay and gravel................ | 57 | 66 |
| Gravel, loose, some water...... | 4 | 70 |
| Clay and gravel................ | 95 | 165 |
| Clay, fine gravel, and quartzite.................... | 10 | 175 |
| Clay.......................... | 25 | 200 |
| Clay and gravel................ | 10 | 210 |
| Gravel, loose, some water...... | 5 | 215 |
| Clay and quartzite............ | 45 | 260 |
| Shale, red.................... | 35 | 295 |
| Shale, red, some water......... | 20 | 315 |
| Shale, red, quartzite and gravel........................ | 45 | 360 |
| Lime, hard, quartzite and shale........................ | 5 | 365 |
| Shale, red, quartzite.......... | 60 | 425 |
| Shale, red, sulfur odor........ | 7 | 432 |
| Shale, red, quartzite, gravel.. | 13 | 445 |
| Bedrock, very hard............ | 1 | 446 |
| MONITORING WELLS | | |
| PS-MW-1s (D-2-4)9bdd-1 | | |
| Alt. 6,791.87 feet. | | |
| Fill, dark brown, soil mixed with sand and gravel.......... | 3 | 3 |
| Clay, moderate brown, with interbedded sand and gravel, intermittent cobbles.......... | 10 | 13 |
| Clay, silty, moderate brown, intermittent layers of gravel and cobbles.................. | 5 | 18 |
| Cobbles, with interbedded clay and sand................ | 1 | 19 |
| Clay, moderate brown, interbedded with sand and gravel....................... | 5 | 24 |
| Clay, moderate brown, interbedded sand and gravel, intermittent layers of cobbles...................... | 6 | 30 |

| Location and material | Thickness | Depth |
|---|---|---|
| PS-MW-1s (D-2-4)9bdd-1--Continued | | |
| Gravel, with interbedded clay and sand...................... | 6 | 36 |
| Clay, moderate brown, inter-bedded sand, intermittent thin layers of cobbles ....... | 3 | 39 |
| Gravel, with interbedded clay and sand...................... | 8 | 47 |
| PS-MW-1d (D-2-4)9bdd-2 | | |
| Alt. 6,791.06 feet. | | |
| Lithology similar to PS-MW-1s for first 45 feet. | | |
| Clay, moderate brown, interbedded sand, fine to coarse, minor amount of gravel, high plasticity....... | 5 | 50 |
| Clay, as above but low to medium plasticity............ | 1 | 51 |
| Sand, fine to coarse, with clay and gravel.............. | 3 | 54 |
| Cobbles, with clay and sand... | 1 | 55 |
| Sand, fine to coarse, with interbedded clay and some gravel....................... | 7 | 62 |
| Clay, moderate brown, with interbedded sand and numerous cobbles...................... | 7 | 69 |
| Clay, moderate brown, with interbedded sand and some gravel, few cobbles.......... | 9 | 78 |
| Clay, as above, high plasticity................ | 5 | 83 |
| Clay, as above, decreasing plasticity with increasing depth........................ | 2 | 85 |
| Bedrock, silty shale, reddish brown........................ | 0.5 | 85.5 |
| PS-MW-2 (D-2-4)9acc-2 | | |
| Alt. 6,758.44 feet. | | |
| Fill, silt, sand, gravel, light brown.................. | 2.5 | 2 |
| Silty sand, light brown,.5 small amount of clay......... | 2 | 4 |
| Sandy clay, dark brown,.5 intermittent gravel, 30 percent..................... | 2.5 | 7 |
| Gravel, cobbles, up to 4 inches, 30 percent silty sand, moderate brown......... | 3.5 | 10 |
| Sand, gravel, moderate brown,.5 intermittent cobble layers.... | 3.5 | 14 |
| Clay, moderate brown, silt and sand present, intermittent cobble layers..................... | 7.5 | 21 |
| Clay, silty, light to.5 moderate brown, medium plasticity, sand and gravel present, unsorted............ | 9.5 | 31 |
| Clay, moderate brown, medium plasticity, fine sand present...................... | 4 | 35 |

Table 2.--Lithologic logs of 2 observation wells and 18 monitoring wells--Continued

| Location and material | Thickness | Depth |
|---|---|---|
| PS-MW-2 (D-2-4)9acc-2--Continued | | |
| Gravel, coarse sand, angular... | 1 | 36 |
| Clay, moderate brown, with fine to medium sand, high plasticity, intermittent, thin cobble layers ............... | 8.5 | 44.5 |
| PS-MW-3 (D-2-4)9aab-1 | | |
| Alt. 6,743.35 feet. | | |
| Topsoil....................... | 1 | 1 |
| Sand, light brown, medium-grained, well sorted......... | 2 | 3 |
| Clay, moderate brown, minor amount of sand and gravel, low plasticity............... | 3 | 6 |
| Cobbles, with clay and sand, moderate brown............... | 6 | 12 |
| Clay, moderate brown, with fine sand, minor amount of cobbles...................... | 3 | 15 |
| Clay, moderate brown, fine sand......................... | 1.5 | 16.5 |
| Clay, moderate brown, with fine sand, intermittent gravel, rounded to angular.... | 9.5 | 26 |
| Clay, moderate brown, with fine sand, medium to high plasticity, some gravel....... | 9 | 35 |
| Gravel, with clay and fine sand......................... | 1 | 36 |
| PS-MW-4 (D-2-4)9adc-1 | | |
| Alt. 6,773.42 feet. | | |
| Sand, light brown, fine to coarse, well rounded, minor amount of gravel............. | 0.5 | 0.5 |
| Clay, dark brown, with minor amount of gravel, thin sand layer........................ | 4 | 4.5 |
| Gravel, with sandy clay, medium plasticity, intermittent thin sand layers....................... | 5.5 | 10 |
| Clay, red-brown, medium plasticity, with fine to medium sand, intermittent pebbles...................... | 3 | 13 |
| Gravel, fine to coarse, angular, minor amount of fine sand......................... | 2 | 15 |
| Clay, red-brown, with fine to medium sand and intermittent quartz pebbles............... | 1 | 16 |
| Gravel and cobbles, angular to subrounded, with minor amount of fine sand.......... | 3.5 | 19.5 |
| Gravel and cobbles, with minor amount of clay, moderate brown, fine sand..... | 1 | 20.5 |
| Cobbles (minimal recovery)..... | 2.5 | 23 |
| Clay, moderate brown, with fine sand and gravel......... | 1.5 | 24.5 |
| Cobbles (minimal recovery)..... | 1.5 | 26 |
| Clay, moderate brown, with fine sand and gravel......... | 5 | 31 |

| Location and material | Thickness | Depth |
|---|---|---|
| PS-MW-4 (D-2-4)9adc-1--Continued | | |
| Clay, moderate brown, tight in some layers, fine sand, intermittent cobble layers.... | 8 | 39 |
| Sand, medium to coarse, poorly sorted, gravel present, interbedded clay..... | 6 | 45 |
| PS-MW-5 (D-2-4)10BCB-1 | | |
| Alt. 6,741.04 feet. | | |
| Topsoil, silty sand, moderate brown......................... | 0.5 | 0.5 |
| Sand, light tan, medium-grained, well sorted.......... | 1 | 1.5 |
| Sand, moderate brown, fine- to medium-grained, some gravel... | 2.5 | 4 |
| Clay, moderate brown, sand, fine to medium, gravel........ | 0.5 | 4.5 |
| Sand, light tan, medium to coarse....................... | 4.5 | 9 |
| Sand, moderate brown, interbedded silty clay, some cobbles present.............. | 3.5 | 12.5 |
| Clay, moderate brown, some silt, gravel in upper foot.... | 2.5 | 15 |
| Clay, moderate brown, with minor amount of interbedded coarse sand, intermittent thin gravel layers........... | 9.5 | 24.5 |
| Clay, moderate brown, with interbedded fine sand, intermittent gravel layers.... | 3.5 | 28 |
| Clay, moderate brown, with fine to medium sand, high plasticity.................. | 6 | 34 |
| PS-MW-5d (D-2-4)10bcb-2 | | |
| Alt. 6,741.99 feet. | | |
| No lithologic log of initial 34 feet. Refer to log of PS-MW-5...................... | 34 | 34 |
| Clay, reddish-brown, matrix mixed with fine to coarse sand, angular to subangular... | 1.5 | 35.5 |
| No data....................... | 8.5 | 44 |
| Clay, gravel, sand, poorly sorted, 60 percent clay, 25 percent gravel, and 15 percent sand, clay reddish-brown, sand medium to coarse, angular to subangular................... | 1.5 | 45.5 |
| No data....................... | 8.5 | 54 |
| Clay, silty, with sand and gravel, poorly sorted, large rock fragment................ | 1.5 | 55.5 |
| No data....................... | 8.5 | 64 |
| Clay, reddish-brown, very fine silt within matrix, clay tight, intermixed rock fragments.................... | 1.5 | 65.5 |
| No data....................... | 13.5 | 79 |

Table 2.--Lithologic logs of 2 observation wells and 18 monitoring wells--Continued

| Location and material | Thickness | Depth |
|---|---|---|
| PS-MW-5d (D-2-4)10bcb-2--Continued | | |
| Clay and gravel, clay reddish-brown, intermixed with angular to subangular fragments, 0-1 inch, possible Woodside Shale....... | 1.5 | 80.5 |
| No data........................ | 13.5 | 94 |
| Clay, silty, reddish-brown, low plasticity................ | 0.5 | 94.5 |
| Gravel, medium to coarse, graded toward top of sample (may not be representative of aquifer material).......... | 1 | 95.5 |
| PS-MW-6 (D-2-4)10bbc-1 | | |
| Alt. 6,731.48 feet. | | |
| Topsoil, moderate to dark brown.......................... | 1.5 | 1.5 |
| Sand, moderate brown, silt, and gravel, poorly sorted, some cobbles.................. | 11.5 | 13 |
| Clay, moderate brown, with interbedded fine sand and gravel........................ | 16 | 29 |
| PS-MW-7 (D-2-4)10bba-1 | | |
| Alt. 6,722.46 feet. | | |
| Topsoil, dark brown........... | 0.5 | 0.5 |
| Sand, silt, clay, moderate brown, with interbedded pebbles....................... | 5.5 | 6 |
| Sand and gravel, light tan, unsorted...................... | 1 | 7 |
| Sandy clay, moderate brown, interbedded gravel............ | 2 | 9 |
| Clay, sandy, moderate brown, numerous interbedded cobbles.. | 7 | 16 |
| Clay, moderate brown, interbedded gravel and sand... | 9.5 | 25.5 |
| PS-MW-7d (D-2-4)10bba-2 | | |
| Alt. 6,722.59 feet. | | |
| Log by D. Coker. | | |
| No lithologic log of initial 30 feet. Refer to log of PS-MW-7 located 5 feet to the north..................... | 25.5 | 25.5 |
| Sand, very fine to fine, angular to subangular, some interbedded coarse gravel, with 10 percent clay matrix... | 1.5 | 27 |
| Sand and clay, unsorted........ | 8 | 35 |
| Clay, red-brown to gray, soft to hard, with black streaks of carbonaceous material, intermittent layers with clay and sand, medium to coarse, subangular to rounded, unsorted...................... | 1.5 | 36.5 |
| Clay, some sand, unsorted...... | 3.5 | 40 |
| Sand, fine to medium, angular to subangular, some rock fragments, and gravel increasing in size with depth, some sandy clay, 5 to 10 percent....................... | 1.5 | 41.5 |
| PS-MW-7d (D-2-4)10bba-2--Continued | | |
| Clay, sandy, brown............ | 3.5 | 45 |
| Clay, brown, with sand and gravel......................... | 1.5 | 46.5 |
| Clay, sandy, brown............ | 4.5 | 51 |
| Clay, sand, gravel, unsorted... | 4 | 55 |
| Clay, sand, gravel, poorly | | |
| Clay, sand, gravel, poorly sorted, angular to subangular, about 10 percent clay......... | 1.5 | 56.5 |
| Clay, sand, gravel, unsorted... | 8.5 | 65 |
| Clay, sand, gravel, with some cobbles, poorly sorted, with quartzite clasts.............. | 1.5 | 66.5 |
| Clay, sand, gravel, poorly sorted........................ | 8.5 | 75 |
| Clay, sand, gravel, cobbles, poorly sorted, with silty shale and sandstone fragments, clay about 10 percent......... | 1.5 | 76.5 |
| Clay, sand, gravel, poorly sorted........................ | 8.5 | 85 |
| Clay, sand, gravel, cobbles, red-brown to yellow-brown, clay also dark green/brown and gray, poorly sorted, subangular to subrounded, sandstone, quartzite, and rock fragments................ | 1.5 | 86.5 |
| Clay, sand, gravel, poorly sorted........................ | 8.5 | 95 |
| Clay, sand, gravel, interbedded and mixed, red-brown, clay sandy and hard, sand, medium to coarse, poorly sorted, subangular to subrounded...... | 1.5 | 96.5 |
| Clay, sand, gravel, poorly sorted........................ | 3.5 | 100 |
| Clay, gray with yellow streaks, hard, imbedded quartzite and sandstone rock fragments, some brown and black carbonaceous material in clay.......................... | 1.5 | 101.5 |
| Clay, sand, gravel, poorly sorted........................ | 8.5 | 110 |
| Clay, sand, gravel, cobbles, red-brown, soft clay, sand, medium to coarse, poorly sorted, quartzite rock fragments..................... | 1.5 | 111.5 |
| Clay, sand, gravel, poorly sorted........................ | 3.5 | 115 |
| Clay, sandy.................... | 5 | 120 |
| Clay, brown with yellow and pink, medium stiffness, silty.......................... | 1.5 | 121.5 |
| Clay, sandy.................... | 8.5 | 130 |
| Gravel, sand, clay............ | 5 | 135 |
| Gravel, fine pebbles, well sorted, subangular to subrounded, a few rock fragments (may not be representative).............. | 1.5 | 136.5 |
| Gravel, sand, clay............ | 1.5 | 138 |

Table 2.--Lithologic logs of 2 observation wells and 18 monitoring wells--Continued

| Location and material | Thickness | Depth |
|---|---|---|
| PS-MW-8 (D-2-4)9aac-3<br>Alt. 6,751.41 feet. | | |
| Topsoil, dark brown............ | 0.5 | 0.5 |
| Sand, silty, moderate brown, with minor amount of interbedded gravel............ | 4 | 4.5 |
| Clay, dark brown, with interbedded fine sand......... | 0.5 | 5 |
| Gravel, cobbles, some sand and silt...................... | 6.5 | 11.5 |
| Clay, silty, moderate brown, minor amount of interbedded coarse sand, medium plasticity................... | 2.5 | 14 |
| Gravel......................... | 1 | 15 |
| Clay, moderate brown, with interbedded sand and gravel... | 1.5 | 16.5 |
| Gravel, with sand and clay..... | 0.5 | 17 |
| Clay, silty, moderate brown.... | 1 | 18 |
| Gravel, with sand and clay..... | 2 | 20 |
| Sand, silty, moderate brown, some clay, low plasticity, interbedded gravel............ | 10 | 30 |
| Sand, coarse, gravel, minor amount of clay and fine sand.. | 10.5 | 40.5 |
| PS-MW-9 (D-2-4)10bab-1<br>Alt. 6,707.90 feet. | | |
| Topsoil, dark brown............ | 1 | 1 |
| Gravel, with sand, coarse...... | 0.5 | 1.5 |
| Sand, light tan, fine-grained, well sorted, mineralized.................. | 0.5 | 2 |
| Clay, moderate brown, with interbedded sand, fine to medium........................ | 0.5 | 2.5 |
| Sand, light tan, fine-grained, well sorted, highly mineralized.................. | 1.5 | 4 |
| Clay, dark brown, organic material present, low plasticity................... | 2.5 | 6.5 |
| Gravel, cobbles, with interbedded sandy clay........ | 3 | 9.5 |
| Gravel, interbedded sandy clay.......................... | 2.5 | 12 |
| Clay, moderate brown, interbedded fine sand and some gravel, high plasticity.. | 3 | 15 |
| Clay, reddish brown, with fine sand and angular rock fragments.................... | 0.5 | 15.5 |
| Bedrock, angular fragments, red silty shale, friable...... | 1 | 16.5 |
| PS-MW-10 (D-2-4)3dcd-1<br>Alt. 6,680 feet. | | |
| Sand, fine to coarse, some gravel........................ | 1 | 1 |
| Soil, dark brown, organic material..................... | 0.5 | 1.5 |
| Sand, fine to coarse, with silty sand lenses and gravel.. | 3.5 | 5 |
| Gravel, fine to coarse, poorly sorted................ | 1 | 6 |
| Sand, fine to coarse, poorly sorted, with silty sand lenses and gravel............ | 4 | 10 |
| PS-MW-10 (D-2-4)3dcd-1--Continued | | |
| Gravel, fine to coarse, poorly sorted................ | 1.5 | 11.5 |
| Bedrock, shale, dark reddish brown, weathered, parts easily....................... | 1.5 | 13 |
| PS-MW-11 (D-2-4)3ccd-1<br>Alt. 6,711.19 feet. | | |
| Fill, sand, silt, gravel, dry, loose.................... | 2 | 2 |
| Clay, dark brown to black, organic, low to medium plasticity................... | 6 | 8 |
| Clay, dark gray to black, with some interbedded gravel, medium to high plasticity..... | 2 | 10 |
| Sand, moderate brown, fine- to medium-grained, some gravel... | 0.5 | 10.5 |
| Sand, silty, with some gravel, reddish-orange color......................... | 5.5 | 16 |
| Clay, dark gray, low plasticity................... | 1 | 17 |
| Gravel, with silt and sand..... | 3 | 20 |
| Sand, gravel, with some gray-green clay.............. | 1.5 | 21.5 |
| PS-MW-11d (D-2-4)3cdc-1<br>Alt. 6,715.89 feet.<br>Log by K. Moll and D. Coker. | | |
| Soil, clayey, silty........... | 1.5 | 1.5 |
| Gravel, sand................... | 2.5 | 4 |
| Clay, silty, with 4-inch layer of decomposed straw..... | 2 | 6 |
| Gravel, with very fine sand.... | 4 | 10 |
| Gravel, coarse, with very fine sand and silt, poorly sorted, rounded to subrounded, quartz, feldspar, and shale rock chips........................ | 1.5 | 11.5 |
| Silt, dark brown, with gravel and very fine to fine sand.... | 3.5 | 15 |
| Clay, dark gray, sticky, very plastic, and gravel, coarse, angular to subrounded, poorly sorted....................... | 1.5 | 16.5 |
| Clay, gravel, poorly sorted.... | 2 | 18.5 |
| Clay, stiff.................. | 1.5 | 20 |
| Clay, dark gray, no plasticity, very stiff................... | 1.5 | 21.5 |
| Clay, dark gray, stiff......... | 5.5 | 27 |
| Sand, fine to coarse, sorted... | 3 | 30 |
| Sand, light brown, very fine to coarse, subangular to subrounded, well sorted....... | 1.5 | 31.5 |
| Sand, coarse, with gravel...... | 7.5 | 39 |
| Gravel, coarse................ | 1 | 40 |
| Gravel, very coarse to cobbles, angular to rounded, sorted.... | 1.5 | 41.5 |
| Gravel, coarse................ | 5.5 | 47 |
| Clay, silty.................. | 3 | 50 |
| Clay, light brown, silty, tight........................ | 1.5 | 51.5 |
| Clay, silty.................. | 3.5 | 55 |
| Sand, light brown, coarse, with gravel, silt 30 percent, and quartz pebbles........... | 1.5 | 56.5 |

Table 2.--Lithologic logs of 2 observation wells and 18 monitoring wells--Continued

| Location and material | Thickness | Depth |
|---|---|---|
| PS-MW-11d (D-2-4)3cdc-1--Continued | | |
| Sand, with gravel | 8.5 | 65 |
| Clay, red-brown, tight, with coarse gravel | 1.5 | 66.5 |
| Clay, with gravel | 1.5 | 68 |
| Sand, light brown, silty, small amount of clay | 7 | 75 |
| Sand, light brown, fine to medium | 1.5 | 76.5 |
| Sand, silty | 3.5 | 80 |
| Sand, light brown, well sorted, grades from fine at top to coarse at bottom split-spoon barrel (may be settling of material inside drill pipe) | 1.5 | 81.5 |
| Sand, fine to coarse | 3.5 | 85 |
| PS-MW-12 (D-2-4)9acc-1<br>Alt. 6,797.70 feet. | | |
| Gravel, with silt and sand, moderate brown | 2 | 2 |
| Gravel, coarse, alternating with layers of sand and gravel | 13 | 15 |
| Gravel, cobbles, alternating with layers of interbeded clay, sand and gravel | 10 | 25 |
| Clay, fine sand, moderate brown, some interbedded gravel | 3 | 28 |
| Cobbles | 1 | 29 |
| Clay, fine sand, moderate brown, some interbedded gravel | 23 | 52 |
| Gravel, some sandy clay | 2 | 54 |
| Clay, sandy, moderate brown, with some interbedded gravel, medium plasticity | 9.5 | 63.5 |
| Clay, sand, fine to coarse, moderate brown, some gravel, high plasticity | 2.5 | 66 |
| Cobbles, sandy clay, moderate brown | 1 | 67 |
| Clay, moderate brown, with interbedded sand and gravel, low plasticity | 12 | 79 |
| Clay, moderate brown, with interbedded sand and gravel, high plasticity | 6 | 85 |
| Cobbles, with interbedded clay, sand, and gravel, dense, moist | 12 | 97 |
| Gravel, sand, fine to coarse, some cobbles, intermittent thin sandy clay layers | 17 | 114 |
| Gravel, sand, fine to coarse, igneous and quartzite boulders | 6 | 120 |
| Bedrock, silty shale, reddish-brown, friable | 5 | 125 |
| PS-MW-13 (D-2-4)4dcb-1<br>Alt. 6,728.42 feet. | | |
| Clay, silty, red-brown, with gravel | 5 | 5 |
| Clay, medium brown, moist | 7 | 12 |
| Clay and gravel, unsorted, with cobbles 2-3 inches in length, subangular | 8 | 20 |
| Clay, light brown, silty, low to medium plasticity, and sand, fine to very fine, iron staining present | 1.5 | 21.5 |
| Clay with some cobbles 1-2 inches in length, poorly sorted, subangular to subrounded | 7.5 | 29 |
| Clay, sand, gravel, poorly sorted | 3 | 32 |
| Gravel, coarse to very coarse, subangular, with 30 percent sand and 10 percent clay | 8 | 40 |
| Clay, medium brown, tight, with very fine sand and interbedded subangular gravel, iron staining present | 1.5 | 41.5 |
| Clay, sand, gravel, unsorted, gravel increasing with depth | 12.5 | 54 |
| Sand, gravel | 1 | 55 |
| Limestone, light gray to white, massive, with weathered shale fragments | 6 | 61 |
| Gravel, coarse, with clay and sand, limestone rock fragments | 1.5 | 62.5 |
| Gravel, with clay and sand | 6.5 | 69 |
| Shale, purple, and limestone | 6 | 75 |
| PS-MW-14 (D-2-4)4dcc-2<br>Alt. 6,712.44 feet. | | |
| Loam, dark brown | 3 | 3 |
| Gravel, with silt and sandy loam | 4 | 7 |
| Gravel | 6 | 13 |
| Gravel, with cobbles | 9 | 22 |
| Clay, with 20-30 percent gravel | 4 | 26 |
| Clay and gravel, unsorted, light brown, subangular clasts | 11 | 37 |
| Gravel, sand, poorly sorted, quartz and siltsone rock fragments (split-spoon sample taken at 37 feet with no recovery) | 12 | 49 |
| Clay, medium brown, with coarse sand | 11 | 60 |

Table 3.—Water levels in 3 observation wells and 18 monitoring wells

Descriptions of measuring points for each well are in the files of the U.S. Geological Survey

Water levels in feet above (+) or below land surface datum.

## OBSERVATION WELLS

Park Meadows well (D- 2- 4) 8AAA- 1

Records available 1979 to current year (1988)

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| JUL 26, 1983 | 29.23 | APR 26, 1984 | 30.35 | FEB 11, 1988 | 31.46 | FEB 18, 1988 | 45.92 |
| SEPT 30 | 29.52 | MAY 25 | 30.62 | 12 | 31.42 | 19 | 37.34 |
| NOV 02 | 29.67 | JUNE 20 | 28.66 | 13 | 31.43 | 20 | 35.48 |
| DEC 21 | 31.03 | MAR 23, 1987 | 32.86 | 14 | 31.38 | 21 | 34.52 |
| JAN 20, 1984 | 31.71 | SEPT 29 | 35.35 | 15 | 31.34 | 23 | 33.23 |
| FEB 27 | 31.88 | FEB 08, 1988 | 32.23 | 16 | 31.32 | MAR 01 | 31.18 |
| MAR 28 | 31.08 | 10 | 31.63 | 17 | 43.36 | 31 | 31.32 |

Pacific Bridge well (D- 2- 4) 9AAC- 1

Records available 1948 to current year (1988)

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| JUL 26, 1983 | 8.30 | FEB 09, 1987 | 25.25 | MAR 23, 1987 | 14.76 | FEB 17, 1988 | 25.01 |
| SEPT 30 | 10.16 | 10 | 25.25 | SEPT 29 | 15.29 | 18 | 25.00 |
| NOV 02 | 13.54 | 11 | 25.24 | DEC 09 | 22.45 | 19 | 25.06 |
| DEC 21 | 17.23 | 12 | 25.08 | JAN 08, 1988 | 24.51 | 20 | 25.05 |
| JAN 20, 1984 | 16.86 | 13 | 25.00 | FEB 08 | 25.24 | 21 | 24.99 |
| FEB 27 | 15.03 | 14 | 25.00 | 09 | 25.25 | 24 | 17.81 |
| MAR 28 | 1.80 | 15 | 24.93 | 10 | 25.25 | MAR 24 | 17.81 |
| APR 26 | +5.75 | 16 | 24.95 | 11 | 25.24 | 31 | 15.27 |
| MAY 25 | +0.82 | 17 | 25.01 | 12 | 25.08 | APR 05 | 14.18 |
| JUNE 22 | +0.08 | 18 | 25.00 | 13 | 25.00 | 11 | 12.82 |
| DEC 09, 1986 | 22.45 | 19 | 25.06 | 14 | 25.00 | 26 | 11.61 |
| JAN 08, 1987 | 24.51 | 20 | 25.05 | 15 | 24.93 | MAY 04 | 11.44 |
| FEB 08 | 25.24 | FEB 21, 1987 | 24.99 | 16 | 24.95 | | |

Cartier well (D- 2- 4) 4DCC- 1

Records available 1970 to current year (1988)

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| MAR 26, 1987 | 31.15 | NOV 24, 1987 | 29.43 | FEB 13, 1988 | 30.78 | MAR 01, 1988 | 30.42 |
| APR 02 | 30.24 | JAN 12, 1988 | 31.06 | 14 | 30.80 | 16 | 30.32 |
| 09 | 28.96 | FEB 08 | 31.05 | 15 | 30.74 | 24 | 29.83 |
| 16 | 29.10 | 09 | 30.97 | 16 | 30.71 | 31 | 29.58 |
| 24 | 29.30 | 10 | 30.90 | 17 | 31.22 | APR 26 | 25.33 |
| MAY 07 | 27.56 | 11 | 30.87 | 18 | 32.70 | MAY 04 | 19.03 |
| OCT 14 | 18.06 | FEB 12, 1988 | 30.80 | 22 | 32.78 | | |

Table 3.—Water levels in 3 observation wells and 18 monitoring wells—Continued

MONITORING WELLS

PS-MW-1s (D- 2- 4) 9BDD- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 27.71 | FEB 08, 1988 | 30.71 | FEB 15, 1988 | 29.71 | MAR 24, 1988 | 23.16 |
| 31 | 26.85 | 09 | 30.61 | 16 | 29.71 | 31 | 23.20 |
| SEPT 25 | 28.87 | 10 | 30.50 | 17 | 29.67 | APR 05 | 23.41 |
| OCT 14 | 29.67 | 11 | 30.45 | 18 | 29.64 | 07 | 23.44 |
| NOV 24 | 30.28 | 12 | 30.11 | 19 | 29.70 | 11 | 23.62 |
| 30 | 30.45 | 13 | 30.00 | 20 | 29.68 | 14 | 23.73 |
| JAN 07, 1988 | 32.35 | 14 | 29.81 | 21 | 29.65 | MAY 04 | 24.16 |
| FEB 06 | 30.76 | | | | | | |

PS-MW-1d (D- 2- 4) 9BDD- 2

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 34.98 | DEC 01, 1987 | 37.54 | JAN 07, 1988 | 38.68 | FEB 03, 1988 | 37.91 |
| 08 | 34.55 | 02 | 37.58 | 08 | 38.70 | 10 | 37.52 |
| 31 | 33.25 | 03 | 37.68 | 09 | 38.76 | 11 | 37.43 |
| SEPT 09 | 33.87 | 04 | 37.73 | 10 | 38.82 | 12 | 37.21 |
| 25 | 35.22 | 05 | 37.75 | 11 | 38.79 | 13 | 36.99 |
| OCT 14 | 35.86 | 06 | 37.84 | 12 | 38.89 | 14 | 36.90 |
| NOV 10 | 37.39 | 07 | 37.88 | 13 | 38.96 | 15 | 36.82 |
| 11 | 37.42 | 08 | 37.96 | 14 | 39.01 | 16 | 36.80 |
| 12 | 37.47 | 09 | 37.98 | 15 | 38.98 | 17 | 36.80 |
| 13 | 37.51 | 10 | 37.99 | 16 | 39.05 | 18 | 36.75 |
| 14 | 37.53 | 11 | 37.72 | 17 | 39.09 | 19 | 36.82 |
| 15 | 37.58 | 12 | 37.59 | 18 | 39.10 | 20 | 36.84 |
| 16 | 37.57 | 13 | 37.55 | 19 | 39.17 | 21 | 36.66 |
| 17 | 37.58 | 14 | 37.59 | 20 | 39.19 | 22 | 36.54 |
| 18 | 37.71 | 15 | 37.52 | 21 | 39.20 | 23 | 36.34 |
| 19 | 37.65 | 26 | 37.13 | 22 | 39.18 | 24 | 36.00 |
| 20 | 37.46 | 27 | 37.44 | 23 | 39.12 | 25 | 35.82 |
| 21 | 37.40 | 28 | 37.69 | 24 | 39.12 | MAR 01 | 33.25 |
| 22 | 37.38 | 29 | 37.87 | 25 | 39.06 | 16 | 29.22 |
| 23 | 37.36 | 30 | 37.95 | 26 | 39.00 | 24 | 28.76 |
| 24 | 37.34 | 31 | 38.16 | 27 | 38.92 | 31 | 28.45 |
| 25 | 37.32 | JAN 01, 1988 | 38.29 | 28 | 38.79 | APR 05 | 28.66 |
| 26 | 37.38 | 02 | 38.36 | 29 | 38.52 | 07 | 28.65 |
| 27 | 37.42 | 03 | 38.45 | 30 | 38.25 | 11 | 29.03 |
| 28 | 37.42 | 04 | 38.52 | 31 | 38.03 | 14 | 29.16 |
| 29 | 37.45 | 05 | 38.56 | FEB 01 | 37.93 | MAY 04 | 30.12 |
| 30 | 37.53 | JAN 06, 1988 | 38.60 | 02 | 37.89 | | |

PS-MW-2 (D- 2- 4) 9AAC- 2

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 30.39 | FEB 06, 1988 | 35.09 | FEB 14, 1988 | 34.66 | FEB 21, 1988 | 34.83 |
| SEPT 01 | 29.97 | 08 | 35.08 | 15 | 34.65 | 24 | 34.52 |
| OCT 14 | 31.65 | 09 | 35.06 | 16 | 34.65 | MAR 05 | 29.49 |
| NOV 24 | 33.34 | 10 | 35.05 | 17 | 34.72 | 11 | 29.24 |
| 30 | 33.72 | 11 | 34.97 | 18 | 34.75 | 13 | 29.13 |
| DEC 09 | 34.15 | 12 | 34.81 | 19 | 34.79 | 26 | 28.61 |
| JAN 08, 1988 | 35.15 | 13 | 34.76 | 20 | 34.83 | 31 | 29.73 |

Table 3.—Water levels in 3 observation wells and 18 monitoring wells—Continued

PS-MW-3 (D- 2- 4) 9AAB- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 22.34 | FEB 06, 1988 | 25.53 | FEB 14, 1988 | 25.43 | FEB 20, 1988 | 25.45 |
| SEPT 03 | 22.45 | 08 | 25.53 | 15 | 25.40 | 21 | 25.46 |
| OCT 14 | 23.35 | 09 | 25.54 | 16 | 25.39 | 24 | 25.40 |
| NOV 24 | 24.13 | 10 | 25.54 | 17 | 25.38 | MAR 31 | 22.68 |
| DEC 01 | 24.40 | 11 | 25.52 | 18 | 25.38 | APR 12 | 22.49 |
| JAN 12, 1988 | 25.47 | 12 | 25.49 | 19 | 25.41 | MAY 04 | 21.87 |

PS-MW-4 (D- 2-4) 9ADC- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 28.64 | FEB 10, 1988 | 33.24 | FEB 17, 1988 | 33.63 | MAR 24, 1988 | 22.09 |
| SEPT 01 | 28.59 | 11 | 33.18 | 18 | 33.72 | 29 | 21.22 |
| OCT 14 | 31.69 | 12 | 32.97 | 19 | 33.85 | 31 | 21.32 |
| NOV 24 | 32.30 | 13 | 32.85 | 20 | 33.94 | APR 05 | 22.10 |
| DEC 01 | 32.84 | 14 | 33.25 | 21 | 33.94 | 11 | 22.40 |
| JAN 07, 1988 | 33.14 | 15 | 33.48 | 24 | 33.30 | 12 | 22.49 |
| FEB 08 | 33.26 | 16 | 33.48 | MAR 16 | 22.04 | MAY 03 | 24.58 |
| 09 | 33.27 | | | | | | |

PS-MW-5 (D- 2- 4)10BCB- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 15.96 | FEB 09, 1988 | 22.22 | FEB 16, 1988 | 22.25 | MAR 24, 1988 | 15.45 |
| SEPT 01 | 16.38 | 10 | 22.24 | 17 | 22.25 | 31 | 14.25 |
| OCT 14 | 19.70 | 11 | 22.25 | 18 | 22.20 | APR 05 | 14.15 |
| NOV 24 | 19.29 | 12 | 22.25 | 19 | 22.23 | 11 | 13.81 |
| DEC 01 | 19.93 | 13 | 22.28 | 20 | 22.31 | 12 | 13.79 |
| JAN 07, 1988 | 21.47 | 14 | 22.25 | 25 | 22.14 | MAY 04 | 13.72 |
| FEB 06 | 22.18 | FEB 15, 1988 | 22.25 | MAR 16 | 16.59 | | |

PS-MW-5d (D- 2- 4)10BCB- 2

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| FEB 25, 1988 | 33.02 | MAR 24, 1988 | 29.71 | APR 05, 1988 | 28.65 | APR 12, 1988 | 28.34 |
| MAR 16 | 30.56 | 31 | 28.97 | 11 | 28.40 | MAY 05 | 28.09 |

Table 3.—Water levels in 3 observation wells and 18 monitoring wells—Continued

PS-MW-6 (D- 2- 4)10BBC- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 13.31 | FEB 08, 1988 | 16.45 | FEB 14, 1988 | 16.47 | FEB 20, 1988 | 16.45 |
| SEPT 02 | 13.44 | 09 | 16.45 | 15 | 16.47 | 21 | 16.45 |
| OCT 14 | 14.71 | 10 | 16.46 | 16 | 16.45 | 24 | 16.40 |
| NOV 24 | 15.09 | 11 | 16.46 | 17 | 16.45 | MAR 31 | 13.78 |
| DEC 01 | 15.26 | 12 | 16.47 | 18 | 16.45 | APR 12 | 12.96 |
| JAN 08, 1988 | 16.08 | 13 | 16.48 | 19 | 16.45 | MAY 04 | 12.31 |

PS-MW-7 (D- 2- 4)10BBA- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 10.69 | FEB 10, 1988 | 11.20 | FEB 17, 1988 | 11.19 | MAR 24, 1988 | 11.01 |
| SEPT 02 | 10.77 | 11 | 11.19 | 18 | 11.20 | 29 | 10.94 |
| OCT 14 | 10.89 | 12 | 11.18 | 19 | 11.18 | 31 | 10.93 |
| NOV 24 | 10.93 | 13 | 11.19 | 20 | 11.19 | APR 05 | 10.89 |
| DEC 01 | 10.97 | 14 | 11.17 | 21 | 11.18 | 11 | 10.88 |
| JAN 07, 1988 | 11.12 | 15 | 11.19 | 25 | 11.19 | 12 | 10.88 |
| FEB 08 | 11.20 | 16 | 11.19 | MAR 16 | 11.07 | MAY 03 | 10.82 |
| 09 | 11.20 | | | | | | |

PS-MW-7d (D- 2- 4)10BBA- 2

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| FEB 16, 1988 | 15.63 | FEB 20, 1988 | 15.75 | MAR 24, 1988 | 14.68 | APR 11, 1988 | 14.28 |
| 17 | 15.63 | 21 | 15.72 | 29 | 14.50 | 12 | 14.25 |
| 18 | 15.66 | 25 | 15.54 | 31 | 14.67 | MAY 05 | 13.67 |
| 19 | 15.73 | MAR 16 | 14.99 | APR 05 | 14.42 | | |

PS-MW-8 (D- 2- 4) 9AAC- 3

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 25.32 | FEB 09, 1988 | 30.02 | FEB 15, 1988 | 29.93 | FEB 21, 1988 | 29.93 |
| SEPT 01 | 25.31 | 10 | 30.00 | 16 | 29.92 | 24 | 29.93 |
| OCT 14 | 27.45 | 11 | 29.98 | 17 | 29.91 | MAR 31 | 22.95 |
| NOV 24 | 28.33 | 12 | 29.97 | 18 | 29.91 | APR 12 | 22.14 |
| DEC 01 | 28.63 | 13 | 29.97 | 19 | 29.91 | MAY 03 | 22.49 |
| JAN 08, 1988 | 29.90 | FEB 14, 1988 | 29.93 | 20 | 29.92 | | |

Table 3.--Water levels in 3 observation wells and 18 monitoring wells--Continued

PS-MW-9 (D- 2- 4)10BAB- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 6.33 | FEB 09, 1988 | 6.98 | FEB 16, 1988 | 6.75 | FEB 25, 1988 | 6.22 |
| SEPT 02 | 6.19 | 10 | 6.93 | 17 | 6.82 | MAR 31 | 5.71 |
| OCT 14 | 5.50 | 11 | 6.80 | 18 | 6.93 | APR 05 | 5.88 |
| NOV 24 | 6.51 | 12 | 6.74 | 19 | 7.03 | 13 | 5.67 |
| DEC 02 | 6.86 | 13 | 6.65 | 20 | 7.03 | 15 | 5.58 |
| JAN 08, 1988 | 7.29 | 14 | 6.79 | 21 | 6.78 | MAY 04 | 5.20 |
| FEB 08 | 6.95 | 15 | 6.68 | | | | |

PS-MW-10 (D- 2- 4) 3DCD- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 07, 1987 | 1.71 | DEC 02, 1987 | 1.50 | FEB 26, 1988 | 1.15 | APR 14, 1988 | 1.00 |
| SEPT 03 | 1.81 | JAN 08, 1988 | 1.65 | APR 12 | 1.01 | MAY 04 | 0.31 |
| NOV 24 | 1.35 | | | | | | |

PS-MW-11 (D- 2- 4) 3CCD- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| SEPT 03, 1987 | 2.12 | FEB 08, 1988 | 2.53 | FEB 15, 1988 | 2.42 | FEB 21, 1988 | 2.50 |
| OCT 14 | 2.18 | 09 | 2.53 | 16 | 2.42 | 26 | 2.44 |
| NOV 24 | 2.44 | 10 | 2.52 | 17 | 2.45 | APR 05 | 1.79 |
| DEC 02 | 2.53 | 11 | 2.50 | 18 | 2.44 | 12 | 1.72 |
| JAN 12, 1988 | 2.70 | 12 | 2.47 | 19 | 2.53 | 14 | 1.72 |
| FEB 06 | 2.53 | 14 | 2.47 | 20 | 2.55 | MAY 03 | 1.50 |

PS-MW-11d (D- 2- 4) 3CDC- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| FEB 09, 1988 | 9.59 | FEB 15, 1988 | 9.52 | FEB 19, 1988 | 9.77 | APR 05 | 9.08 |
| 10 | 9.57 | 16 | 9.50 | FEB 20, 1988 | 9.75 | 12 | 8.99 |
| 11 | 9.53 | 17 | 9.54 | 21 | 9.70 | 14 | 8.97 |
| 12, 1988 | 9.49 | 18 | 9.64 | 26 | 9.46 | MAY 03 | 8.32 |
| 14 | 9.52 | | | | | | |

PS-MW-12 (D- 2- 4) 9ACC- 1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| AUG 31, 1987 | 38.95 | FEB 09, 1988 | 42.41 | FEB 16, 1988 | 41.67 | MAR 16, 1988 | 35.58 |
| OCT 14 | 41.11 | 10 | 42.32 | 17 | 41.62 | 24 | 35.23 |
| NOV 24 | 42.27 | 11 | 42.20 | 18 | 41.57 | 31 | 34.70 |
| 30 | 42.52 | 12 | 41.90 | 19 | 41.67 | APR 05 | 34.88 |
| JAN 07, 1988 | 43.80 | 13 | 41.80 | 20 | 41.66 | 11 | 35.15 |
| FEB 06 | 42.50 | 14 | 41.80 | 21 | 41.56 | 14 | 35.28 |
| 08 | 42.45 | 15 | 41.71 | 23 | 41.40 | MAY 03 | 36.17 |

Table 3.--Water levels in 3 observation wells and 18 monitoring wells--Continued

PS-MW-13 (D- 2- 4) 4DCB-1

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| FEB 08, 1988 | 8.33 | FEB 25, 1988 | 8.62 | APR 07, 1988 | 7.41 | APR 24, 1988 | 7.09 |
| 09 | 8.12 | 26 | 8.39 | 08 | 7.45 | 25 | 7.53 |
| 10 | 7.91 | 27 | 8.19 | 09 | 7.45 | 26 | 7.77 |
| 11 | 7.87 | 28 | 8.04 | 10 | 7.43 | 27 | 7.86 |
| 12 | 7.81 | 29 | 7.90 | 11 | 7.40 | 28 | 8.18 |
| 13 | 7.74 | MAR 01 | 7.82 | 12 | 7.39 | 29 | 8.40 |
| 14 | 7.77 | 16 | 7.72 | 13 | 7.37 | 30 | 8.32 |
| 15 | 7.70 | 25 | 7.53 | 14 | 7.39 | MAY 01 | 8.30 |
| 16 | 7.70 | 29 | 7.42 | 15 | 7.44 | 02 | 8.22 |
| 17 | 8.80 | 30 | 7.57 | 16 | 7.36 | 03 | 8.63 |
| 18 | 10.74 | 31 | 7.77 | 17 | 7.38 | 04 | 8.78 |
| 19 | 12.36 | APR 01 | 7.59 | 18 | 7.37 | 05 | 8.74 |
| 20 | 11.51 | 02 | 7.51 | 19 | 7.21 | 06 | 8.78 |
| 21 | 10.43 | 03 | 7.47 | 20 | 7.13 | 07 | 9.16 |
| 22 | 9.77 | 04 | 7.48 | 21 | 7.06 | 08 | 9.10 |
| 23 | 9.28 | 05 | 7.51 | 22 | 7.05 | 09 | 9.13 |
| 24 | 8.92 | 06 | 7.44 | 23 | 7.09 | JUNE 06 | 11.98 |

PS-MW-14 (D- 2- 4) 4DCC-2

| Date | Water level | Date | Water level | Date | Water level | Date | Water level |
|---|---|---|---|---|---|---|---|
| FEB 09, 1988 | 27.69 | MAR 10, 1988 | 26.83 | APR 09, 1988 | 25.73 | MAY 08, 1988 | 19.84 |
| 10 | 27.65 | 11 | 26.84 | 10 | 25.67 | 09 | 19.84 |
| 11 | 27.64 | 12 | 26.87 | 11 | 25.62 | 10 | 20.01 |
| 12 | 27.59 | 13 | 26.90 | 12 | 25.58 | 11 | 20.55 |
| 13 | 27.57 | 14 | 26.90 | 13 | 25.53 | 12 | 19.92 |
| 14 | 27.58 | 15 | 26.89 | 14 | 25.50 | 13 | 18.97 |
| 15 | 27.55 | 16 | 27.07 | 15 | 25.63 | 14 | 17.78 |
| 16 | 27.56 | 17 | 26.99 | 16 | 25.39 | 15 | 17.52 |
| 17 | 27.90 | 18 | 26.92 | 17 | 25.35 | 16 | 18.14 |
| 18 | 28.55 | 19 | 26.83 | 18 | 24.89 | 17 | 18.16 |
| 19 | 28.97 | 20 | 26.79 | 19 | 22.39 | 18 | 17.70 |
| 20 | 28.97 | 21 | 26.76 | 20 | 20.97 | 19 | 17.81 |
| 21 | 28.78 | 22 | 26.70 | 21 | 19.13 | 20 | 18.12 |
| 22 | 28.59 | 23 | 26.64 | 22 | 19.12 | 21 | 17.80 |
| 23 | 28.45 | 24 | 26.58 | 23 | 19.60 | 22 | 18.15 |
| 24 | 28.28 | 25 | 26.71 | 24 | 20.03 | 23 | 18.29 |
| 25 | 28.13 | 26 | 26.43 | 25 | 20.23 | 24 | 17.67 |
| 26 | 27.98 | 27 | 26.31 | 26 | 20.47 | 25 | 17.90 |
| 27 | 27.84 | 28 | 26.21 | 27 | 20.44 | 26 | 18.28 |
| 28 | 27.56 | 29 | 26.10 | 28 | 19.96 | 27 | 18.68 |
| 29 | 27.29 | 30 | 26.14 | 29 | 19.43 | 28 | 19.48 |
| MAR 01 | 27.24 | 31 | 26.17 | 30 | 19.02 | 29 | 19.36 |
| 02 | 27.11 | APR 01 | 26.09 | MAY 01 | 18.70 | 30 | 18.53 |
| 03 | 27.03 | 02 | 26.04 | 02 | 18.62 | 31 | 18.62 |
| 04 | 26.93 | 03 | 25.98 | 03 | 18.33 | JUNE 01 | 18.26 |
| 05 | 26.85 | 04 | 25.96 | 04 | 18.99 | 02 | 18.23 |
| 06 | 26.84 | 05 | 25.93 | 05 | 19.21 | 03 | 18.50 |
| 07 | 26.86 | 06 | 25.85 | 06 | 19.89 | 04 | 18.75 |
| 08 | 26.88 | 07 | 25.78 | 07 | 20.15 | 05 | 19.00 |
| 09 | 26.84 | 08 | 25.77 | | | | |

Table 4.—Estimated values of hydraulic conductivity (in feet per day)

| Location | Hydraulic Conductivity | Method |
|---|---|---|
| PS-MW-1s | 1 | Bouwer and Rice |
| PS-MW-1d | [1]1 | Cooper, Bredehoeft, and Papadopulos |
| PS-MW-2 | 7 | Bouwer and Rice |
| PS-MW-3 | 9 | Bouwer and Rice |
| PS-MW-4 | 3 | Bouwer and Rice |
| PS-MW-5 | 2 | Bouwer and Rice |
| PS-MW-5d | [1]1 | Cooper, Bredehoeft, and Papadopulos |
| PS-MW-6 | [1]10 | Bouwer and Rice |
| PS-MW-7 | 14 | Bouwer and Rice |
| PS-MW-7d | 2 | Cooper, Bredehoeft, and Papadopulos |
| PS-MW-8 | [1]1 | Bouwer and Rice |
| PS-MW-9 | [1]10 | Bouwer and Rice |
| PS-MW-10 | 4 | Bouwer and Rice |
| PS-MW-11 | 6 | Bouwer and Rice |
| PS-MW-11d | [1]10 | Bouwer and Rice |
| PS-MW-12 | 2 | Bouwer and Rice |

[1]Values rounded to nearest order of magnitude.

Table 5.—Field parameters at surface-water sites

[°C, degrees Celsius; µS/cm, microsiemens per centimeter at 25° Celsius; ft, feet; s, second; mg/L, milligrams per liter]

| Location | Date | Temperature, field (° C) | Specific conductance, field (µS/cm) | Instantaneous discharge ($ft^3/s$) | pH, field (units) | Alkalinity, field (mg/L as $CaCO_3$) | Bicarbonate (mg/L) | Carbonate (mg/L) |
|---|---|---|---|---|---|---|---|---|
| Silver Creek at Bonanza Drive | 04-29-87 | 18.5 | 990 | 0.76 | 8.6 | 102 | 120 | 12 |
| | 07-09-87 | 19.0 | 925 | 0.04 | 8.6 | 84 | 104 | 0 |
| | 04-13-88 | 15.5 | 1,190 | 1.99 | 8.5 | [1]107 | [1]131 | [1]0 |
| Silver Creek at Wyatt Earp Drive | 04-29-87 | 18.0 | 1,080 | 0.65 | 8.6 | 100 | 120 | 8 |
| | 07-09-87 | 19.5 | 1,570 | 0.002 | 8.0 | 123 | 150 | 0 |
| | 04-13-88 | 15.5 | 1,200 | 1.45 | 8.5 | [1]109 | [1]153 | [1]0 |
| Silver Creek below Prospector Square | 04-29-87 | 11.0 | 990 | 2.18 | 7.5 | 151 | 180 | 0 |
| | 07-09-87 | 13.5 | 1,450 | 0.24 | 7.4 | 105 | 128 | 0 |
| | 04-13-88 | 13.0 | 1,010 | 4.31 | 7.8 | [1]152 | [1]185 | [1]0 |
| Pace-Homer Ditch at Park Meadows Collection box | 04-29-87 | 15.5 | 720 | 0.08 | 8.0 | 174 | 210 | 0 |
| | 07-09-87 | 19.5 | 825 | 2.03 | 8.2 | 116 | 142 | 0 |
| | 04-13-88 | 10.0 | 695 | 0.893 | 8.0 | [1]186 | [1]227 | [1]0 |
| Pace-Homer Ditch below Prospector Square | 04-29-87 | 13.0 | 830 | 1.33 | 7.9 | 184 | 220 | 0 |
| | 07-09-87 | 18.0 | 870 | 2.50 | 8.2 | 134 | 164 | 0 |
| | 04-13-88 | 9.0 | 775 | 2.44 | 7.6 | [1]185 | [1]225 | [1]0 |

[1]Values determined by State lab.

**collected from surface-water sites**
EPA, U.S. Environmental Protection Agency;
dashes indicate no data; <, less than]

| Barium, dissolved (µg/L as Ba) | Beryllium, dissolved (µg/L as Be) | Cadmium, dissolved (µg/L as Cd) | Chromium, dissolved (µg/L as Cr) | Cobalt, dissolved (µg/L as Co) | Copper, dissolved (µg/L as Cu) | Iron, dissolved (µg/L as Fe) | Lead, dissolved (µg/L as Pb) | Manganese, dissolved (µg/L as Mn) | Mercury, dissolved (µg/L as Hg) | Nickel, dissolved (µg/L as Ni) | Silver, dissolved (µg/L as Ag) | Zinc, dissolved (µg/L as Zn) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 83 | <0.5 | 1 | <10 | <3 | 10 | 8 | <10 | 130 | <0.1 | <10 | <1 | 68 |
| 74 | <1 | 1 | <5 | <20 | <20 | 40 | 10 | 120 | <0.25 | <10 | <2 | 59 |
| <70 | <3 | <4 | <10 | <20 | 30 | <60 | 7 | 122 | <0.4 | <24 | -- | 62 |
| 61 | <0.5 | 1 | <10 | <3 | 10 | 15 | <10 | 12 | <0.1 | <10 | <1 | 28 |
| 51 | -- | 1 | <5 | -- | -- | <20 | 10 | 11 | -- | -- | <10 | 30 |
| 49 | <1 | <4 | <4 | <9 | 6.1 | 29 | <5 | 18 | <0.2 | <8 | <4 | 38 |
| 94 | <0.5 | 4 | <5 | <3 | 10 | 6 | <10 | 290 | -- | <10 | <1 | 140 |
| 81 | <1 | <1 | <5 | <20 | <20 | 20 | <5 | 270 | <0.2 | <10 | <2 | 150 |
| 84 | <0.5 | 2 | <10 | <3 | <10 | 4 | <10 | 280 | <0.1 | -- | <1 | 80 |
| 75 | <1 | 2 | <5 | <20 | <20 | <20 | 10 | 260 | 0.2 | <10 | <2 | 70 |
| 80 | <3 | <4 | <10 | <30 | 23 | <60 | 9 | 259 | <0.2 | <24 | -- | 68 |
| 73 | <0.5 | 13 | <10 | <3 | <10 | 4 | <10 | 2,910 | 0.1 | -- | <1 | 3,400 |
| 62 | -- | 17 | <5 | -- | -- | <20 | <5 | 2,900 | -- | -- | <10 | 3,300 |
| 60 | <1 | 17 | <4 | <9 | 10 | 27 | <5 | 2,970 | <0.2 | 8.5 | <4 | 3,500 |
| 88 | <0.5 | 2 | <5 | <3 | <10 | 5 | <10 | 240 | -- | <10 | <1 | 160 |
| 74 | <1 | <1 | <5 | <20 | <20 | 20 | <5 | 220 | <0.2 | <10 | <2 | 170 |
| 41 | <1 | 4 | <5 | <20 | <20 | <20 | 10 | 360 | 0.25 | <10 | <2 | 590 |
| <70 | <3 | <4 | <10 | <30 | 16 | <60 | 8 | 353 | <0.2 | <24 | <10 | 559 |
| 49 | -- | 7 | <5 | -- | - | 81 | -- | 970 | -- | -- | <10 | 2,300 |
| 46 | <1 | 6 | <4 | <4 | <6 | 80 | 6.2 | 980 | <0.2 | <8 | <4 | 2,380 |
| 49 | <0.5 | 2 | <5 | <3 | <10 | 15 | <10 | 180 | -- | <10 | 1 | 280 |
| 39 | <1 | <1 | <5 | <20 | <20 | 20 | <5 | 170 | <0.2 | <10 | <2 | 270 |
| 50 | <1 | <1 | <5 | <20 | <20 | 320 | <5 | 170 | 0.2 | <10 | <2 | 33 |
| <70 | <3 | <4 | <10 | <30 | <11 | <60 | <5 | 158 | <0.2 | <24 | -- | 32 |
| 22 | -- | <1 | <5 | -- | -- | <20 | <5 | 57 | -- | -- | <10 | <15 |
| 22 | <1 | <4 | <4 | 9 | 28 | <24 | <5 | 60 | <0.2 | <8 | <4 | 16 |
| 64 | <0.5 | 2 | <5 | <3 | <10 | 22 | <10 | 310 | -- | <10 | <1 | 4 |
| 52 | <1 | <1 | <5 | <20 | <20 | 21 | <5 | 290 | <0.2 | <10 | <2 | 29 |
| 23 | <1 | <1 | <5 | <20 | <20 | 580 | 5 | 75 | 0.25 | <10 | <2 | 52 |
| <70 | <3 | <4 | <10 | <30 | 13 | 110 | 27 | 72 | <0.2 | <24 | <10 | 63 |
| 30 | -- | <1 | <5 | -- | -- | <20 | <5 | 11 | -- | -- | <10 | 26 |
| 28 | <1 | <4 | <4 | <9 | 11 | <24 | 14 | 23 | <0.2 | <8 | <4 | 23 |
| 44 | <0.5 | <1 | <5 | <3 | <10 | 16 | <10 | 110 | -- | <10 | <1 | 47 |
| 36 | <1 | <1 | <5 | <20 | <20 | 20 | <5 | 110 | <0.2 | <10 | <2 | 62 |

**Table 6.—Chemical analyses of filtered water**

[USGS, U.S. Geological Survey; State, Utah Department of Health;
mg/L, milligrams per liter; $\mu$g/L, micrograms per liter;

| Location | Date of sample | Report-ing-agency | Cal-cium, dis-solved (mg/L as Ca) | Magne-sium, dis-solved (mg/L as Mg) | Sodium, dis-solved (mg/L as Na) | Potas-sium, dis-solved (mg/L as K) | Chlo-ride, dis-solved (mg/L as Cl) | Sul-fate, dis-solved (mg/L as $SO_4$) | Alum-inum, dis-solved ($\mu$g/L as Al) | Arsenic, dis-solved ($\mu$g/L as As) |
|---|---|---|---|---|---|---|---|---|---|---|
| Silver Creek at Bonanza Drive | 04-29-87 | USGS | 79 | 16 | 100 | 2.9 | 200 | 120 | -- | 5 |
| | | State | 76 | 15 | 96 | 3 | 173 | 110 | <200 | 5.5 |
| | | EPA | 78.4 | 5.5 | 95.8 | 8 | -- | -- | <140 | <10 |
| | 07-09-87 | USGS | 78 | 17 | 71 | 2.9 | 150 | 110 | -- | 6 |
| | | State | -- | -- | -- | -- | -- | -- | -- | 7 |
| | | EPA | 79.4 | 17.3 | 76.5 | 3.2 | -- | -- | 32 | <10 |
| | 04-13-88 | USGS | 82 | 17 | 130 | 3.1 | 260 | 92 | -- | 3 |
| | | State | -- | -- | -- | -- | 267.4 | 82 | -- | 2.5 |
| | | EPA | | | | | | | | |
| Silver Creek at Wyatt Earp Drive | 04-29-87 | USGS | 87 | 17 | 110 | 2.9 | 220 | 150 | -- | 5 |
| | | State | 83 | 17 | 100 | 3 | 174 | 120 | <200 | 4.5 |
| | | EPA | 83 | 17.1 | 106 | 2.7 | -- | -- | <140 | <10 |
| | 07-09-87 | USGS | 230 | 62 | 39 | 3.9 | 55 | 650 | -- | 2 |
| | | State | -- | -- | -- | -- | -- | -- | -- | 3.2 |
| | | EPA | 238 | 63.1 | 40.6 | 4.2 | -- | -- | 17 | <10 |
| | 04-13-88 | USGS | 83 | 17 | 130 | 3.3 | 260 | 100 | -- | 3 |
| | | State | -- | -- | -- | -- | 259.5 | 89 | -- | 1.5 |
| | | EPA | | | | | | | | |
| Silver Creek below Prospector Square | 04-29-87 | USGS | | | | | | | | |
| | | State | 120 | 27 | 44 | 2 | 98 | 210 | <200 | 5.5 |
| | | EPA | 123 | 27.2 | 46.7 | 2.4 | -- | -- | <140 | <10 |
| | 07-09-87 | USGS | | | | | | | | |
| | | State | -- | -- | -- | -- | -- | -- | -- | 9.5 |
| | | EPA | 218 | 34.4 | 48 | 3.8 | -- | -- | 26 | <10 |
| | 04-13-88 | USGS | 110 | 27 | 64 | 2.9 | 140 | 180 | -- | 6 |
| | | State | -- | -- | -- | -- | 147.5 | 180 | -- | 5.5 |
| | | EPA | | | | | | | | |
| Pace-Homer Ditch at Park Meadows Collection box | 04-29-87 | USGS | | | | | | | | |
| | | State | 91 | 31 | 17 | 2 | 27 | 180 | <200 | 12.5 |
| | | EPA | 94.2 | 29.8 | 17.3 | 1.8 | -- | -- | <140 | <10 |
| | 07-09-87 | USGS | | | | | | | | |
| | | State | -- | -- | -- | -- | -- | -- | -- | 18.5 |
| | | EPA | 120 | 36.3 | 8.8 | 1.8 | -- | -- | 16 | 17 |
| | 04-13-88 | USGS | 89 | 29 | 20 | 2.6 | 28 | 150 | -- | 8 |
| | | State | -- | -- | -- | -- | 29.9 | 140 | -- | 5.5 |
| | | EPA | | | | | | | | |
| Pace-Homer Ditch below Prospector Square | 04-29-87 | USGS | | | | | | | | |
| | | State | 100 | 31 | 22 | 2 | 15.5 | 170 | <200 | 5.5 |
| | | EPA | 107 | 30.5 | 23.3 | 1.7 | -- | -- | <140 | <10 |
| | 07-09-87 | USGS | | | | | | | | |
| | | State | -- | -- | -- | -- | -- | -- | -- | 12.5 |
| | | EPA | 120 | 33.8 | 16.8 | 1.9 | -- | -- | 20 | 11 |
| | 04-13-88 | USGS | 110 | 30 | 23 | 2.1 | 47 | 180 | -- | 5 |
| | | State | -- | -- | -- | -- | 48 | 170 | -- | 2.5 |
| | | EPA | | | | | | | | |

**Table 7.–Chemical analyses from unfiltered**

[USGS, U.S. Geological Survey; State, Utah Department of Health; μg/L, micrograms per liter;

| LOCATION | Date of sample | Reporting agency | Calcium, total (mg/L as Ca) | Magnesium, total (mg/L as Mg) | Sodium, total (mg/L as Na) | Potassium, total (mg/L as K) | Aluminum, total (μg/L as Al) | Arsenic, total (μg/L as As) | Barium, total (μg/L as Ba) |
|---|---|---|---|---|---|---|---|---|---|
| Silver Creek at Bonanza Drive | 04-29-87 | USGS | 72 | 17 | 90 | 2.8 | — | 17 | 100 |
| | | State | 77 | 16 | 97 | 3 | 580 | 18 | 91 |
| | | EPA | 76.9 | 15.7 | 97 | 3.2 | 1,360 | 27 | 80 |
| | 07-09-87 | USGS | 71 | 16 | 62 | 2.7 | — | 6 | <100 |
| | | State | -- | - | -- | - | — | 7 | 51 |
| | | EPA | 78.9 | 17.2 | 76.4 | 3 | 60 | <10 | 51 |
| | 04-13-88 | USGS | | | | | | | |
| | | State | 79 | 16 | 130 | 3 | <400 | 2 | 73 |
| | | EPA | 97.3 | 22.4 | 54.6 | 1.9 | <100 | 5.2 | 34 |
| Silver Creek at Wyatt Earp Drive | 04-29-87 | USGS | 74 | 17 | 91 | 2.7 | — | 18 | 100 |
| | | State | 78 | 16 | -- | 3 | 500 | 14 | 80 |
| | | EPA | 78.2 | 15.7 | 563 | 3.3 | 1,370 | 17 | <70 |
| | 07-09-87 | USGS | 170 | 50 | 29 | 3.6 | — | 2 | <100 |
| | | State | -- | — | -- | -- | 3.5 | 62 | |
| | | EPA | 238 | 63.1 | 40.6 | 42 | 17 | <10 | 60 |
| | 04-13-88 | USGS | | | | | | | |
| | | State | 81 | 17 | 130 | 3 | 450 | 5.5 | 84 |
| | | EPA | 69.8 | 14.2 | 110 | 1.9 | <100 | 28 | 66 |
| Silver Creek below Prospector Square | 04-29-87 | USGS | | | | | | | |
| | | State | 120 | 27 | 45 | 3 | <200 | 10 | 44 |
| | | EPA | 120 | 26.6 | 47 | 2.4 | 420 | 12 | <70 |
| | 07-09-87 | USGS | | | | | | | |
| | | State | -- | — | -- | -- | — | 16 | 47 |
| | | EPA | 225 | 34.7 | 49.4 | 4 | 198 | 12 | 46 |
| | 04-13-88 | USGS | | | | | | | |
| | | State | 110 | 26 | 66 | 3 | <400 | 3.5 | 36 |
| | | EPA | 71.1 | 14.4 | 112 | 1.6 | <100 | <2 | -- |
| Pace-Homer Ditch at Park Meadows Collection box | 04-29-87 | USGS | | | | | | | |
| | | State | 91 | 31 | 17 | 2 | <200 | 10.5 | 51 |
| | | EPA | 95.7 | 31.1 | 17.5 | 1.9 | <140 | 10 | <70 |
| | 07-09-87 | USGS | | | | | | | |
| | | State | -- | — | -- | -- | — | 19 | 23 |
| | | EPA | 118 | 35.4 | 9.4 | 1.9 | 71 | 18 | 11 |
| | 04-13-88 | USGS | | | | | | | |
| | | State | 86 | 27 | 20 | 3 | <400 | 5.5 | 55 |
| | | EPA | 77.2 | 24.9 | 17.5 | 1.5 | <100 | 5.4 | 46 |
| Pace-Homer Ditch below Prospector Square | 04-29-87 | USGS | | | | | | | |
| | | State | 100 | 30 | 22 | 2 | <200 | 7.5 | 25 |
| | | EPA | 105 | 29.8 | 22.8 | 1.7 | <140 | <10 | <70 |
| | 07-09-87 | USGS | | | | | | | |
| | | State | -- | — | -- | -- | — | 13 | 31 |
| | | EPA | 120 | 33.2 | 16.1 | 1.8 | 32 | 12 | 30 |
| | 04-13-88 | USGS | | | | | | | |
| | | State | 100 | 28 | 22 | 2 | <400 | 3.5 | 39 |
| | | EPA | 91.5 | 25.6 | 19.4 | 1.2 | <100 | 5.2 | 31 |

**water collected at surface-water sites**
EPA, U.S. Environmental Protection Agency; mg/L, milligrams per liter;
dashes indicate no data; <. less than]

| Beryllium, total (µg/L as Be) | Cadmium, total (µg/L as Ca) | Chromium, total (µg/L as Cr) | Cobalt, total (µg/L as Co) | Copper, total (µg/L as Cu) | Cyanide, total (µg/L as Cn) | Iron, total (µg/L as Fe) | Lead, total (µg/L as Pb) | Manganese, total (µg/L as Mn) | Mercury, total (µg/L as Hg) | Nickel, total (µg/L as Ni) | Silver, total (µg/L as Ag) | Zinc, total (µg/L as Zn) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | 8 | <10 | -- | 44 | <10 | 1,900 | 700 | 290 | 0.3 | -- | 1 | 960 |
| <1 | 5 | <5 | <20 | 38.0 | <20 | 1,600 | 700 | 290 | 0.75 | <10 | <2 | 870 |
| <3 | <4 | <10 | <30 | 54 | <10 | 2,350 | 580 | 309 | <0.2 | <24 | <10 | 525 |
| -- | <1 | <10 | -- | 8 | <10 | 150 | 21 | 20 | 0.1 | -- | 2 | 50 |
| -- | <1 | <5 | -- | <20 | -- | 110 | 10 | 13 | <0.2 | -- | <0.2 | 57 |
| <1 | <4 | <4 | <9 | 11 | <10 | 192 | 42 | 28 | <0.2 | <8 | <4 | 77 |
| <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | <5 | <0.2 | <10 | <2 | 65 |
| <2 | <1.1 | <4 | <6 | 22 | 19 | 111 | 14 | 165 | <0.2 | <11 | 5.5 | 260 |
| -- | 7 | <10 | -- | 38 | <10 | 1,400 | 440 | 350 | 0.3 | -- | 1 | 620 |
| <1 | 4 | <5 | <20 | 31 | <20 | 1,100 | 430 | 350 | 0.55 | <10 | <2 | 560 |
| <3 | <4 | <10 | <30 | 40 | <10 | 1,860 | 330 | 309 | <0.2 | <24 | <10 | 525 |
| -- | <3 | 46 | -- | 5 | <10 | 90 | 18 | 2,400 | <0.1 | -- | 2 | 3,100 |
| -- | 16 | <5 | -- | <20 | -- | 72 | <5 | 2,900 | <0.2 | -- | <0.2 | 3,300 |
| <1 | 17 | <4 | <9 | 10 | -- | 27 | <5 | 2,970 | <0.2 | 8.5 | <4 | 3,500 |
| <1 | 4 | <5 | <20 | <20 | <20 | 770 | <5 | 310 | <0.2 | <10 | <2 | 440 |
| <2 | 1.1 | <4 | <6 | 21 | <10 | <100 | 4.2 | 207 | <0.2 | <11 | <5 | 151 |
| <1 | 6 | <5 | <20 | <20 | <20 | 580 | 165 | 410 | 0.65 | <10 | <2 | 780 |
| <3 | <4 | <10 | <30 | 26 | -- | 810 | 166 | 382 | <0.2 | <24 | -- | 755 |
| -- | 7 | <5 | -- | 220 | 00 | 79 | 105 | 1,000 | <0.2 | -- | <0.2 | 2,500 |
| <1 | 7.1 | <4 | <9 | 16 | <10 | 759 | 161 | 1,050 | 0.3 | 8.6 | 4 | 2,610 |
| <1 | 1 | <5 | <20 | <20 | <20 | <20 | <5 | <5 | <0.2 | 10 | <2 | 100 |
| <2 | <1.1 | <4 | <6 | 23 | <10 | <100 | 3.5 | 260 | <0.2 | <11 | <5 | 136 |
| <1 | <1 | <5 | <20 | <20 | <20 | 82 | <5 | 170 | 0.25 | <10 | <2 | 31 |
| <3 | <4 | <10 | <30 | <11 | <10 | 120 | <5 | 129 | <0.2 | 24 | 92 | 29 |
| -- | <1 | <5 | -- | 56 | -- | 85 | <5 | 83 | <0.2 | -- | <0.2 | 100 |
| <1 | <4 | <4 | <9 | 56 | <10 | 90 | <5 | 86 | <0.2 | <8 | <4 | 23 |
| <1 | 1 | <5 | <20 | <20 | <20 | 83 | <5 | 310 | <0.2 | 10 | <2 | <20 |
| <2 | <1.1 | <4 | <6 | 14 | <10 | 121 | 17 | 284 | <0.2 | <11 | <5 | 14 |
| <1 | <1 | <5 | <20 | <20 | <20 | 61 | 30 | 82 | 0.75 | <10 | <2 | 62 |
| <3 | <4 | <10 | <30 | 20 | <10 | <60 | 24 | 63 | <0.2 | 24 | 119 | 73 |
| -- | 4 | <5 | -- | <20 | -- | 57 | <5 | 33 | <0.2 | -- | <0.2 | 240 |
| <1 | <4 | <4 | <9 | 16 | <10 | 65 | 13 | 33 | <0.2 | <8 | <4 | 28 |
| <1 | <1 | <5 | <20 | <20 | <20 | 57 | <5 | 120 | <0.2 | <10 | <2 | 64 |
| <2 | <1.1 | <4 | <6 | 10 | <10 | 152 | 11 | 106 | <0.2 | <11 | <5 | 50 |

Table 8.--**Chemical analyses of total recoverable metals from stream sediment**
[Constituents in parts per million; USGS, U.S. Geological Survey; State, Utah Department of Health; EPA, U.S. Environmental Protection Agency]

Surface-water sampling April 29, 1987

| | Silver Creek at Bonanza Drive | | | Silver Creek at Wyatt Earp Drive | | | Silver Creek below Prospector Square | | Pace Homer Ditch below Prospector Square | |
|---|---|---|---|---|---|---|---|---|---|---|
| | USGS | State | EPA | USGS | State | EPA | State | EPA | State | EPA |
| Arsenic | 190 | 180 | 2,173 | 220 | -- | 229 | 300 | 256 | 190 | 159 |
| Barium | 470 | 180 | 263 | 510 | -- | 200 | 37 | 213 | 37 | 77 |
| Cadmium | 27 | 29 | 43 | 38 | -- | 33 | 72 | 45 | 32 | 23 |
| Chromium | 100 | 49 | 186 | 80 | -- | 52 | 31 | 50 | 49 | 44 |
| Copper | 330 | 240 | 280 | 390 | -- | 191 | 360 | 343 | 360 | 293 |
| Iron | 30,000 | 22,000 | 54,500 | 37,000 | -- | 30,600 | 30,000 | 36,400 | 25,000 | 24,500 |
| Lead | 5,200 | 4,500 | 5,900 | 6,000 | -- | 3,910 | 4,300 | 5,960 | 3,600 | 3,786 |
| Manganese | 1,700 | 1,400 | 5,020 | 1,600 | -- | 1,430 | 1,300 | 1,570 | 1,500 | 1,430 |
| Mercury | <4. | 2.5 | 16 | <4. | -- | 24 | 5.5 | 8.5 | 7 | 1.1 |
| Silver | 38 | 21 | 18 | 42 | -- | 28 | 31 | 31 | 26 | 18 |
| Zinc | 5,500 | 4,000 | 7,390 | 7,800 | -- | 6,130 | 9,300 | 8,320 | 4,500 | 4,710 |

Surface-water sampling on July 9, 1987

| | Silver Creek at Bonanza Drive | | | Silver Creek at Wyatt Earp Drive | | | Silver Creek below Prospector Square | | Pace-Homer Ditch below Prospector Square | |
|---|---|---|---|---|---|---|---|---|---|---|
| | USGS | State | EPA | USGS | State | EPA | State | EPA | State | EPA |
| Arsenic | 140 | 58 | 514 | 57 | 46 | 25 | 58 | 385 | 220 | 54 |
| Barium | 430 | 150 | 682 | 520 | 170 | 93 | 6.7 | 96 | 150 | 58 |
| Cadmium | 32 | 29 | 123 | 23 | 24 | 14 | 83 | 63 | 43 | 14 |
| Chromium | 100 | 41 | 115 | 81 | 44 | 15 | 19 | 14 | 38 | 8.7 |
| Copper | 280 | 170 | 1,200 | 120 | 69 | 58 | 580 | 400 | 430 | 154 |
| Iron | 35,000 | 23,000 | 86,300 | 25,000 | 24,000 | 13,000 | 32,000 | 24,000 | 22,000 | 6,370 |
| Lead | 4,900 | 3,200 | 19,300 | 1,700 | 960 | 670 | 7,700 | 5,000 | 4,600 | 1,640 |
| Manganese | 1,500 | 1,300 | 4,090 | 3,700 | 2,200 | 2,050 | 1,700 | 1,650 | 1,100 | 431 |
| Mercury | 6.6 | 3.6 | 14 | 4.4 | 2.2 | 1.5 | 6.5 | 7.2 | 16 | 6.6 |
| Silver | 26 | 15 | 110 | 10 | 5.3 | 5.9 | 51 | 35 | 36 | 12 |
| Zinc | 6,800 | 4,500 | 22,900 | 4,100 | 3,300 | 3,130 | 15,000 | 12,800 | 7,400 | 2,330 |

Surface-water sampling on April 13, 1988

| | Silver Creek at Bonanza Drive | | Silver Creek at Wyatt Earp Drive | | Silver Creek below Prospector Square | | Pace-Homer Ditch below Prospector Square | |
|---|---|---|---|---|---|---|---|---|
| | State | EPA | State | EPA | State | EPA | State | EPA |
| Arsenic | 93 | 165 | 100 | 22.9 | 370 | 78.4 | 200 | 143 |
| Barium | 200 | 73.1 | 140 | 109 | 6 | 164 | 170 | 215 |
| Cadmium | 15 | 96.5 | 14 | 3.5 | 140 | 23.6 | 31 | 28.9 |
| Chromium | 75.5 | 14.3 | 43 | 24.6 | 30 | 31.5 | 72 | 59.1 |
| Copper | 93 | 317 | 63 | 36.4 | 1,400 | 173 | 440 | 435 |
| Iron | 2,000 | 23,200 | 29,000 | 25,700 | 30,000 | 21,000 | 3,500 | 30,100 |
| Lead | 1,300 | 5,290 | 380 | 164 | 12,000 | 2,960 | 3,100 | 3,340 |
| Manganese | 1,800 | 1,910 | 410 | 294 | 1,900 | 1,450 | 1,300 | 1,500 |
| Mercury | 1.2 | 3.6 | 0.4 | 0.3 | 3.4 | 1.8 | 6.7 | 12 |
| Silver | 6.8 | 31.6 | 3 | 2.7 | 86 | 15.4 | 20 | 22.8 |
| Zinc | 2,100 | 19,000 | 720 | 372 | 30,000 | 3,670 | 4,700 | 4,890 |

Table 9.—Chemical analyses of

[°C, degrees Celsius; μS/cm, microsiemens per centimeter at 25 °Celsius; EPA, U.S. Environmental Protection Agency; mg/L, milligrams per liter;

| Location | Date of sample | Temperature, field (°C) | Specific conductance, field (μS/cm) | pH, field (units) | Reporting agency | Alkalinity, lab (mg/L as $CaCO_3$) | Bicarbonate (mg/L) | Carbonate (mg/L) | Calcium, dissolved (mg/L as Ca) | Magnesium, dissolved (mg/L as Mg) | Sodium, dissolved (mg/L as Na) | Potassium, dissolved (mg/L as K) | Chloride, dissolved (mg/L as Cl) | Sulfate, dissolved (mg/L as $SO_4$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PS-MW-1s (D-2-4)9bdd-1 | 08-31-87 | 13.5 | 3,830 | 6.8 | USGS | 140 | -- | -- | 320 | 61 | 270 | 3.3 | 910 | 260 |
| | | | | | State | -- | -- | -- | 340 | 60 | 260 | 3 | 925 | 250 |
| | | | | | EPA | -- | -- | -- | 354 | 61.7 | 277 | 4.03 | -- | -- |
| | 11-30-87 | 10.5 | 3,530 | 6.8 | USGS | | | | | | | | | |
| | | | | | State | 137 | 168 | 0 | 340 | 63 | 280 | 3 | 885 | 270 |
| | | | | | EPA | -- | -- | -- | 359 | 62.1 | 310 | 3.52 | -- | -- |
| | 04-11-88 | 11.0 | 3,380 | 6.1 | USGS | | | | | | | | | |
| | | | | | State | 138 | 169 | 0 | 320 | 55 | 270 | 3 | 889.9 | 240 |
| | | | | | EPA | 135 | -- | -- | 294 | 51.8 | -- | 3.5 | 860 | 260 |
| PS-MW-1d (D-2-4)9bdd-2 | 08-31-87 | 13.0 | 1,840 | 6.8 | USGS | 90 | -- | -- | 220 | 43 | 74 | 2.3 | 380 | 240 |
| | | | | | State | -- | -- | -- | 230 | 44 | 77 | 2 | 380 | 240 |
| | | | | | EPA | -- | -- | -- | 220 | 41.3 | 72.1 | 2.32 | -- | -- |
| | 11-30-87 | 10.0 | 2,060 | 6.7 | USGS | | | | | | | | | |
| | | | | | State | 114 | 140 | 0 | 260 | 52 | 88 | 2 | 450 | 270 |
| | | | | | EPA | -- | -- | -- | 249 | 49.3 | 91.1 | 2.39 | -- | -- |
| | 02-23-88 | 10.0 | 2,100 | 7.4 | USGS | | | | | | | | | |
| | | | | | State | 113 | -- | -- | 260 | 48 | 88 | 2 | 500 | 250 |
| | | | | | EPA | -- | -- | -- | 248 | 47.6 | 83.6 | 2.5 | -- | -- |
| | 04-11-88 | 12.0 | 2,160 | 6.6 | USGS | 115 | -- | -- | 250 | 51 | 88 | 2.3 | 500 | 260 |
| | | | | | State | 113 | 138 | 0 | 260 | 49 | 87 | 2 | 534.9 | 240 |
| | | | | | EPA | 102 | -- | -- | 230 | 44.5 | 80.2 | 1.6 | 437 | 238 |
| PS-MW-2 (D-2-4)9aac-2 | 09-01-87 | 14.0 | 1,740 | 6.7 | USGS | 108 | -- | -- | 220 | 44 | 58 | 2.0 | 370 | 200 |
| | | | | | State | -- | -- | -- | 230 | 44 | 53 | 2 | 357 | 210 |
| | | | | | EPA | -- | -- | -- | -- | 41.8 | 51.1 | 1.57 | -- | -- |
| | 11-30-87 | 10.0 | 1,770 | 6.5 | USGS | | | | | | | | | |
| | | | | | State | 121 | 148 | 0 | 230 | 46 | 54 | 2 | 362 | 210 |
| | | | | | EPA | -- | -- | -- | 255 | 50.5 | 61.5 | 2.04 | -- | -- |
| | 02-24-88 | 8.5 | 1,220 | 7.2 | USGS | | | | | | | | | |
| | | | | | State | 121 | -- | -- | 240 | 43 | 50 | 2 | 360 | 200 |
| | | | | | EPA | -- | -- | -- | 220 | 42.1 | 48 | 2.2 | -- | -- |
| | 04-11-88 | 12.5 | 1,710 | 6.2 | USGS | 122 | -- | -- | 220 | 43 | 50 | 1.9 | 340 | 230 |
| | | | | | State | 121 | 147 | 0 | 220 | 42 | 49 | 2 | 364.9 | 210 |
| | | | | | EPA | 112 | -- | -- | 210 | 40.3 | 48.6 | 1.4 | 332 | 226 |
| PS-MW-3 (D-2-4)9aab-1 | 09-03-87 | 10.0 | 1,730 | 7.0 | USGS | 146 | -- | -- | 180 | 35 | 110 | 1.9 | 350 | 190 |
| | | | | | State | -- | -- | -- | 180 | 36 | 110 | 2 | 345 | 180 |
| | | | | | EPA | -- | -- | -- | 184 | 35.9 | 114 | 1.63 | -- | -- |
| | 12-01-87 | 10.0 | 1,630 | 6.7 | USGS | | | | | | | | | |
| | | | | | State | 154 | 188 | 0 | 170 | 34 | 110 | 2 | 300 | 200 |
| | | | | | EPA | -- | -- | -- | 186 | 36.9 | 134 | 1.94 | -- | -- |
| | 02-24-88 | 9.0 | 1,580 | 7.0 | USGS | | | | | | | | | |
| | | | | | State | 155 | -- | -- | 160 | 31 | 110 | 2 | 310 | 180 |
| | | | | | EPA | -- | -- | -- | 153 | 29.5 | 104 | 2.3 | -- | -- |
| | 04-12-88 | 13.5 | 1,580 | 6.7 | USGS | 151 | -- | -- | 170 | 34 | 110 | 1.9 | 330 | 170 |
| | | | | | State | 150 | 184 | 0 | 170 | 32 | 110 | 2 | 349.9 | 180 |
| | | | | | EPA | 142 | -- | -- | 157 | 31.3 | -- | 1.6 | 292 | -- |

**water from wells and drains**
USGS, U.S. Geological Survey; State, State of Utah Department of Health;
µg/L, micrograms per liter; dashes indicate no data; <, less than]

| Aluminum, dissolved (µg/L as Al) | Arsenic, dissolved (µg/L as As) | Barium, dissolved (µg/L as Ba) | Beryllium, dissolved (µg/L) as Be) | Cadmium, dissolved (µg/L as Cd) | Chromium, dissolved (µg/L as Cr) | Cobalt, dissolved (µg/L as Co) | Copper, dissolved (µg/L as Cu) | Cyanide, Total (µg/L as Cn) | Iron, dissolved (µg/L as Fe) | Lead, dissolved (µg/L as Pb) | Manganese, dissolved (µg/L as Mn) | Mercury, dissolved (µg/L as Hg) | Nickel, dissolved (µg/L as Ni) | Silver, dissolved (µg/L as Ag) | Zinc, dissolved (µg/L as Zn) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | <1 | 120 | <0.5 | <1 | <5 | <3 | <10 | -- | 120 | <10 | 110 | -- | <10 | 1 | 19 |
| <400 | <1.1 | 96 | <1 | <1 | <30 | <20 | <20 | <23 | <20 | <5 | 94 | <0.2 | -- | <2 | 25 |
| <100 | <6 | 103 | <4 | <4 | <9 | <7 | <17 | <10 | <100 | <20 | 99.1 | <0.2 | <6 | 9.2 | 22.5 |
| <400 | <1.1 | 94 | 2 | -- | <5 | <20 | <20 | <20 | -- | <5 | 90 | <0.2 | <10 | 2 | 69 |
| <90 | <2 | 109 | <2 | 0.7 | <10 | <25 | <8 | <10 | 57 | 1.7 | 99 | <0.2 | <22 | <6 | 71 |
| <400 | <1 | 100 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | 22 | 0.23 | <10 | <2 | <20 |
| <100 | <2 | 98 | <2 | <1.1 | <4 | <6 | 16 | <10 | <100 | <30 | 28 | <0.2 | <11 | <5 | 14 |
| -- | <1 | 110 | <0.5 | <1 | <5 | <3 | <10 | -- | -- | <10 | 460 | -- | 10 | <1 | 12 |
| <400 | <1.1 | 89 | 1 | -- | <30 | <20 | <20 | <20 | 79 | <5 | 430 | <0.2 | -- | <2 | 19 |
| <100 | <6 | 91.6 | <4 | <4 | <9 | <7 | <17 | <10 | <100 | <20 | 434 | <0.2 | 7 | <7 | <7 |
| <400 | <1.1 | 70 | 1 | -- | <5 | <20 | <20 | <20 | 51 | <5 | 75 | <0.2 | <10 | <2 | <20 |
| 113 | <2 | 79 | <2 | 1.3 | <10 | <25 | 18 | <10 | 101 | 1.6 | 80 | <0.2 | <22 | <6 | 85 |
| <200 | <1 | 63 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | 16 | <0.2 | <10 | <2 | 44 |
| <100 | <3 | 60 | <4 | <0.5 | <9 | <9 | <12 | <1 | <100 | <2 | 14 | 0.2 | 13 | <8 | <20 |
| -- | 1 | 74 | <0.5 | <3 | <5 | <3 | <10 | -- | 4 | <10 | 9 | -- | <10 | <1 | 5 |
| <400 | 1.5 | 65 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | 12 | 0.23 | <10 | <2 | <20 |
| <100 | <2 | -- | <2 | <1.1 | <4 | <6 | 12 | <10 | 138 | <3 | 14 | <0.2 | <11 | 15 | 48 |
| -- | <1 | 65 | <0.5 | <1 | <5 | <3 | <10 | -- | 63 | <10 | 110 | -- | <10 | <1 | 30 |
| <400 | <1.1 | 53 | 1 | 1 | <30 | <20 | <20 | <20 | 95 | <5 | 110 | <0.2 | -- | <2 | 26 |
| <100 | <6 | 47.1 | <4 | <4 | <9 | <7 | <17 | <10 | <100 | <2 | 79.7 | <0.2 | <6 | <7 | <7 |
| <400 | <1.1 | 55 | <1 | -- | <5 | <20 | <20 | <20 | 33 | <5 | 30 | 0.2 | <10 | <2 | 41 |
| <90 | <2 | 67 | <2 | 0.4 | <10 | <25 | <8 | <10 | 26 | 1.8 | 32 | <0.2 | <22 | <6 | 22 |
| <200 | <1 | 54 | <1 | <1 | <5 | <20 | <20 | <20 | 25 | <5 | 64 | <0.2 | <10 | <2 | 89 |
| <100 | <3 | 51 | <4 | 1 | <9 | <9 | 20 | <1 | <100 | 2.3 | 80 | 0.4 | <7 | <8 | <20 |
| -- | 2 | 61 | <0.5 | 3 | <5 | <3 | <10 | -- | 6 | <10 | 3 | -- | <10 | 1 | 3 |
| <400 | <1 | 54 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | <5 | 2.6 | <10 | <2 | <20 |
| <100 | <2 | 54 | <2 | <1.1 | <4 | <6 | 11 | <10 | 100 | <3 | 7.3 | <0.2 | <11 | <5 | <7 |
| -- | <1 | 110 | <0.5 | <1 | <5 | <3 | <10 | -- | 14 | <10 | 6 | -- | <10 | <1 | 6 |
| <400 | <1.1 | 100 | <1 | <1 | <30 | <20 | <20 | <20 | <20 | <5 | 8 | <0.2 | -- | <2 | <15 |
| <100 | <6 | 101 | <4 | <4 | <9 | <7 | 27.8 | <10 | <100 | <20 | 8.8 | <0.2 | <6 | <7 | <7 |
| <400 | 1.1 | 70 | 1 | -- | <5 | <20 | <20 | <20 | <20 | <5 | 6 | <0.2 | <10 | <2 | <20 |
| <90 | <2 | 86 | <2 | 0.2 | <10 | <25 | <8 | <10 | 100 | 2.5 | 5 | <0.2 | <22 | <6 | 16 |
| <200 | <1 | 71 | <1 | <1 | <5 | <20 | <20 | <20 | 27 | <5 | 7 | <0.2 | <10 | <2 | 52 |
| <100 | <3 | 63 | <4 | <0.5 | <9 | <9 | <12 | <1 | <100 | 3.2 | <8 | 0.4 | <7 | <8 | <20 |
| -- | <1 | 86 | <0.5 | <1 | <5 | <3 | <10 | -- | 140 | <10 | 13 | -- | <10 | <1 | 12 |
| <400 | <1.1 | 76 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | 13 | <0.2 | <10 | <2 | 26 |
| <100 | <2 | 70 | <2 | <1.1 | 4.5 | <6 | 34 | <10 | <100 | <3 | 7.8 | <0.2 | <11 | <5 | 9.1 |

| Location | Date of sample | Temperature, field (°C) | Specific conductance, field (µS/cm) | pH, field (units) | Reporting agency | Alkalinity, lab (mg/L as $CaCO_3$) | Bicarbonate (mg/L) | Carbonate (mg/L) | Calcium, dissolved (mg/L as Ca) | Magnesium, dissolved (mg/L as Mg) | Sodium, dissolved (mg/L as Na) | Potassium, dissolved (mg/L as K) | Chloride, dissolved (mg/L as Cl) | Sulfate, dissolved (mg/L as $SO_4$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PS-MW-4 (D-2-4)0adc-1 | 09-01-87 | 13.0 | 1,490 | 6.4 | USGS | 87 | -- | -- | 220 | 38 | 42 | 6.7 | 140 | 540 |
| | | | | | State | -- | -- | -- | 220 | 39 | 53 | 7 | 132 | 530 |
| | | | | | EPA | -- | -- | -- | 226 | 39.1 | 54.9 | 8.1 | -- | -- |
| | 12-01-87 | 11.0 | 1,540 | 6.9 | USGS | | | | | | | | | |
| | | | | | State | 104 | 128 | 0 | 240 | 39 | 51 | 6 | 130 | 540 |
| | | | | | EPA | -- | -- | -- | 262 | 47.8 | 62.6 | 6.93 | -- | -- |
| | 02-24-88 | 10.5 | 1,710 | 7.3 | USGS | | | | | | | | | |
| | | | | | State | 97 | -- | -- | 230 | 40 | 80 | 7 | 262 | 450 |
| | | | | | EPA | -- | -- | -- | 220 | 38.2 | 71.4 | 6.6 | -- | -- |
| | 04-12-88 | 12.0 | 1,380 | 6.2 | USGS | 60 | -- | -- | 200 | 34 | 47 | 7.2 | 150 | 490 |
| | | | | | State | 60 | 74 | 0 | 190 | 33 | 52 | 7 | 153 | 470 |
| | | | | | EPA | 55 | -- | -- | 177 | 30.7 | 50.9 | 5.3 | 145 | -- |
| PS-MW-5 (D-2-4)10bab-1 | 09-01-87 | 14.5 | 1,350 | 6.5 | USGS | 54 | -- | -- | 190 | 34 | 56 | 4.2 | 130 | 500 |
| | | | | | State | -- | -- | -- | 200 | 34 | 54 | 4 | 125 | 500 |
| | | | | | EPA | -- | -- | -- | 206 | 35.2 | 57.1 | 5.25 | -- | -- |
| | 12-01-87 | 11.0 | 1,300 | 6.7 | USGS | 80 | -- | -- | 190 | 33 | 49 | 3.3 | 110 | 460 |
| | | | | | State | 80 | 98 | 0 | 190 | 34 | 48 | 3 | 105 | 470 |
| | | | | | EPA | -- | -- | -- | 189 | 34.8 | 55.2 | 3.39 | -- | -- |
| | 02-24-88 | 11.5 | 1,250 | 6.9 | USGS | 104 | -- | -- | 190 | 35 | 39 | -- | 88 | 490 |
| | | | | | State | 104 | -- | -- | 210 | 37 | 40 | 2 | 90 | 500 |
| | | | | | EPA | -- | -- | -- | 199 | 36.5 | 40.8 | 2.3 | -- | -- |
| | 04-12-88 | 12.0 | 1,300 | 6.2 | USGS | 63 | -- | -- | 220 | 43 | 49 | 3.8 | 130 | 470 |
| | | | | | State | 63 | 77 | 0 | 180 | 32 | 50 | 4 | 130 | 460 |
| | | | | | EPA | 58 | -- | -- | 165 | 29.3 | 46 | 2.5 | 125 | 484 |
| PS-MW-5d (D-2-4)10bcb-2 | 02-25-88 | 12.0 | 775 | 7.5 | USGS | 114 | -- | -- | 110 | 27 | 16 | 1.7 | 33 | 260 |
| | | | | | State | 114 | -- | -- | 110 | 27 | 16 | 2 | 34.9 | 250 |
| | | | | | EPA | -- | -- | -- | 108 | 25.9 | 15 | 1.4 | -- | -- |
| | 04-12-88 | 12.0 | 775 | 7.1 | USGS | 115 | -- | -- | 110 | 27 | 16 | 1.2 | 33 | 260 |
| | | | | | State | 115 | 141 | 0 | 110 | 26 | 15 | 1 | 31.9 | 240 |
| | | | | | EPA | 108 | -- | -- | 99.8 | 24 | 14.2 | 0.7 | 36 | 258 |
| PS-MW-6 (D-2-4)10bbc-1 | 09-02-87 | 16.0 | 1,520 | 6.5 | USGS | 55 | -- | -- | 230 | 33 | 44 | 4.4 | 130 | 550 |
| | | | | | State | -- | -- | -- | 240 | 33 | 42 | 5 | 132 | 550 |
| | | | | | EPA | -- | -- | -- | 247 | 34 | 44.6 | 5.48 | -- | -- |
| | 12-01-87 | 11.0 | 1,470 | 6.9 | USGS | 55 | -- | -- | 230 | 32 | 42 | 4.3 | 140 | 540 |
| | | | | | State | 57 | 70 | 0 | 240 | 32 | 40 | 4 | 130 | 540 |
| | | | | | EPA | -- | -- | -- | 236 | 33.2 | 43.8 | 4.3 | -- | -- |
| | 02-24-88 | 11.0 | 1,380 | 6.5 | USGS | 55 | -- | -- | 210 | 29 | 38 | 4.3 | 130 | 490 |
| | | | | | State | 56 | -- | -- | 220 | 29 | 38 | 4 | 127 | 500 |
| | | | | | EPA | -- | -- | -- | 198 | 27.3 | 33.8 | -- | -- | -- |
| | 04-12-88 | 14.0 | 1,370 | 6.3 | USGS | 56 | -- | -- | 220 | 32 | 41 | 4.3 | 130 | 540 |
| | | | | | State | 55 | 67 | 0 | 230 | 30 | 40 | 4 | 138 | 530 |
| | | | | | EPA | 50 | -- | -- | 208 | 29.5 | 38.5 | 2.9 | 112 | -- |

| Aluminum, dissolved (μg/L as Al) | Arsenic, dissolved (μg/L as As) | Barium, dissolved (μg/L as Ba) | Beryllium, dissolved (μg/L) as Be) | Cadmium, dissolved (μg/L as Cd) | Chromium, dissolved (μg/L as Cr) | Cobalt, dissolved (μg/L as Co) | Copper, dissolved (μg/L as Cu) | Cyanide, Total (μg/L as Cn) | Iron, dissolved (μg/L as Fe) | Lead, dissolved (μg/L as Pb) | Manganese, dissolved (μg/L as Mn) | Mercury, dissolved (μg/L as Hg) | Nickel, dissolved (μg/L as Ni) | Silver, dissolved (μg/L as Ag) | Zinc, dissolved (μg/L as Zn) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | <1 | 38 | <0.5 | 5 | <5 | <3 | <10 | -- | 23 | <10 | 300 | -- | <10 | <1 | 1,800 |
| <400 | <1.1 | 27 | <1 | 6 | <30 | <20 | <20 | <20 | 290 | <5 | 300 | <0.2 | -- | <2 | 1,700 |
| <100 | <6 | 40 | <4 | 6.4 | <9 | <7 | <17 | <10 | <100 | <2 | 317 | <0.2 | <6 | <7 | 1,940 |
| <400 | <1.1 | 40 | 2 | 3 | <5 | <20 | <20 | <20 | 120 | <5 | 1,800 | <0.2 | <10 | <2 | 640 |
| <90 | <2 | 47 | <2 | 3.2 | <10 | <25 | <8 | <10 | 145 | 3.1 | 2,250 | <0.2 | <22 | <6 | 759 |
| <200 | 1 | 43 | <1 | 2 | <5 | <20 | <20 | <20 | 91 | <5 | 2,700 | <0.2 | 10 | <2 | 400 |
| <100 | <3 | <45 | 4 | <0.5 | <9 | <9 | 26 | <1 | 259 | <2 | 2,750 | <0.2 | 9.5 | <8 | 361 |
| -- | <1 | 60 | <0.5 | 9 | <5 | <3 | <10 | -- | 3 | <10 | 46 | -- | <10 | <1 | 2,300 |
| <400 | <1.1 | 22 | <1 | 8 | <5 | <20 | <20 | <20 | <20 | <5 | 46 | <0.2 | <10 | <2 | 2,400 |
| <100 | <2 | 20 | <2 | <5.5 | <4 | <6 | 12 | 18 | <100 | <3 | 44 | <0.2 | <11 | <5 | 2,290 |
| -- | <1 | 51 | <0.5 | 6 | <5 | <3 | <10 | -- | 33 | <10 | 120 | -- | 10 | <1 | 2,300 |
| <400 | 1.2 | 38 | <1 | — | <30 | <20 | <20 | <20 | 380 | <5 | 120 | <0.2 | -- | <2 | 2,100 |
| <100 | <6 | 42.5 | <4 | 7.1 | <9 | <7 | <17 | <10 | <100 | <2 | 126 | <0.2 | 12.4 | <7 | 2,460 |
| -- | 1 | 50 | <0.5 | 3 | <5 | <3 | 10 | -- | 29 | <10 | 260 | -- | <10 | 1 | 880 |
| <400 | <1.1 | 45 | 1 | — | <5 | <20 | <20 | <20 | 86 | <5 | 260 | 0.2 | <10 | <2 | 930 |
| <90 | <2 | 49 | <2 | 3.1 | <10 | <25 | <8 | <10 | 32 | 2.7 | 276 | <0.2 | <22 | <6 | 899 |
| -- | <1 | 38 | <0.5 | 3 | <5 | <3 | <10 | -- | 150 | <10 | 120 | -- | <10 | <1 | 71 |
| <200 | <1 | 31 | <1 | <1 | <5 | <20 | <20 | <20 | 20 | <5 | 100 | <0.2 | <10 | <2 | 97 |
| <100 | <3 | <45 | <4 | <0.5 | <9 | <9 | <12 | <1 | <100 | 3 | 487 | 0.2 | <7 | <8 | <20 |
| -- | <1 | 62 | <0.5 | 2 | <5 | <3 | <10 | -- | 4 | <10 | 2 | -- | <10 | <1 | — |
| <400 | <1.1 | 32 | <1 | — | <5 | <20 | <20 | <20 | <20 | <5 | 44 | <0.2 | <10 | <2 | 1,900 |
| <100 | <2 | 29 | <2 | 3.6 | 5.2 | <6 | 12 | 16 | 121 | <3 | 47 | <0.2 | 13 | <5 | 1,780 |
| -- | <1 | 89 | <0.5 | 2 | <5 | <3 | <10 | -- | 14 | <10 | 500 | -- | <10 | <1 | 19 |
| 460 | <1 | 82 | <1 | <1 | <5 | <20 | <20 | <20 | 260 | <5 | 470 | <0.2 | <10 | <2 | 59 |
| <100 | <3 | <45 | <4 | <0.5 | <9 | <9 | <12 | <1 | <100 | 10 | 107 | 0.4 | <7 | <8 | 74 |
| -- | 2 | 73 | <0.5 | <1 | <5 | 3 | <10 | -- | 3 | <10 | 88 | -- | <10 | <1 | 6 |
| <400 | <1.1 | 67 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | 86 | <0.2 | <10 | <2 | <20 |
| <100 | <2 | 61 | <2 | <1.1 | <4 | <6 | 14 | <10 | <100 | <3 | 82 | <0.2 | <11 | <5 | 8.8 |
| -- | <1 | 38 | <0.5 | 6 | <5 | <3 | <10 | -- | 14 | <10 | 440 | -- | <10 | <1 | 1,100 |
| <400 | <1.1 | 25 | <1 | — | <30 | <20 | <20 | <20 | 160 | <5 | 440 | <0.2 | -- | <2 | 1,100 |
| 136 | <6 | 40 | <4 | 5.9 | <9 | <7 | <17 | <10 | 136 | <2 | 456 | <0.2 | <6 | <7 | 1,210 |
| -- | 1 | 27 | <0.5 | 7 | <5 | <3 | <10 | -- | 51 | <10 | 270 | -- | <10 | <1 | 1,200 |
| <400 | <1.1 | 22 | <1 | — | <5 | <20 | <20 | <20 | -- | <5 | 280 | <0.2 | <10 | <2 | 1,400 |
| <90 | <2 | 23 | <2 | 5.8 | <10 | <25 | <8 | <10 | 89 | 2.0 | 287 | <0.2 | <22 | <6 | 1,300 |
| -- | 2 | 34 | <0.5 | 7 | <5 | <3 | <10 | -- | 9 | <10 | 82 | -- | <10 | 1 | 1,100 |
| <200 | <1 | 26 | <1 | 6 | <5 | <20 | <20 | <20 | <20 | <5 | 85 | 0.25 | <10 | <2 | 1,100 |
| <100 | <3 | <45 | <4 | 5.4 | <9 | <9 | 14 | <1 | <100 | 2.6 | 80 | 0.3 | <7 | <8 | 1,060 |
| -- | <1 | 31 | <0.5 | 8 | <5 | <3 | <10 | -- | 6 | <10 | — | -- | <10 | <1 | 1,500 |
| <400 | <1.1 | 22 | <1 | 8 | <5 | <20 | <20 | <20 | <20 | <5 | 57 | <0.2 | <10 | <2 | 1,600 |
| <100 | <2 | 20 | <2 | <5.5 | 5.1 | <6 | 18 | <10 | <100 | <3 | 63 | <0.2 | <11 | <5 | 1,540 |

| Location | Date of sample | Temper-ature, field (°C) | Spe-cific con-duct-ance, field (µS/cm) | pH, field (units) | Report-ing-agency | Alka-linity, lab (mg/L as $CaCO_3$) | Bi-carbo-nate (mg/L) | Carbo-nate (mg/L) | Cal-cium, dis-solved (mg/L as Ca) | Magne-sium, dis-solved (mg/L as Mg) | Sodium, dis-solved (mg/L as Na) | Potas-sium, dis-solved (mg/L as K) | Chlo-ride, dis-solved (mg/L as Cl) | Sul-fate, dis-solved (mg/L as $SO_4$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PS-MW-7 (D-2-4)10bba-1 | 09-02-87 | 16.0 | 1,570 | 6.4 | USGS | 47 | -- | -- | 250 | 33 | 42 | 5.7 | 110 | 660 |
| | | | | | State | -- | -- | -- | 260 | 33 | 52 | 6 | 110 | 660 |
| | | | | | EPA | -- | -- | -- | 269 | 33.2 | 53.1 | 7.05 | -- | -- |
| | 12-01-87 | 10.0 | 1,530 | 6.4 | USGS | 49 | -- | -- | 240 | 30 | 41 | 5.4 | 110 | 630 |
| | | | | | State | 59 | 72 | 0 | 260 | 31 | 51 | 6 | 110 | 640 |
| | | | | | EPA | -- | -- | -- | 225 | 29.2 | 50.3 | 5.34 | -- | -- |
| | 02-25-88 | 6.5 | 1,310 | 6.2 | USGS | 50 | -- | -- | 220 | 29 | 42 | 2.5 | 120 | 580 |
| | | | | | State | 56 | -- | -- | 240 | 29 | 51 | 5 | 120 | 590 |
| | | | | | EPA | -- | -- | -- | 220 | 27.4 | 46.6 | 5.1 | -- | -- |
| | 04-12-88 | 12.5 | 1,450 | 6.0 | USGS | 59 | -- | -- | 230 | 30 | 42 | 5.5 | 120 | 610 |
| | | | | | State | 58 | 71 | 0 | 230 | 28 | 49 | 5 | 120 | 580 |
| | | | | | EPA | -- | -- | -- | 216 | 27.2 | 47.2 | 3.5 | 112 | -- |
| PS-MW-7d (D-2-4)10bba-2 | 02-25-88 | 8.0 | 355 | 7.5 | USGS | 121 | -- | -- | 43 | 11 | 11 | 1.1 | 12 | 45 |
| | | | | | State | 119 | -- | -- | 44 | 12 | 12 | 1 | 12 | 45 |
| | | | | | EPA | -- | -- | -- | 41.8 | 11 | 10.3 | <0.5 | -- | -- |
| | 04-12-88 | 13.5 | 339 | 7.4 | USGS | 123 | -- | -- | 44 | 12 | 11 | 0.9 | 12 | 46 |
| | | | | | State | 123 | 150 | 0 | 43 | 11 | 11 | <1 | 12.3 | 44 |
| | | | | | EPA | 115 | -- | -- | 37.2 | 10 | 9.4 | 0.5 | -- | 31 |
| PS-MW-8 (D-2-4)9aac-3 | 09-01-87 | 18.5 | 1,470 | 6.8 | USGS | 52 | -- | -- | 220 | 31 | 49 | 6.2 | 160 | 490 |
| | | | | | State | -- | -- | -- | 220 | 32 | 48 | 7 | 155 | 490 |
| | | | | | EPA | -- | -- | -- | 228 | 32.2 | 48.8 | 7.49 | -- | -- |
| | 12-01-87 | 11.0 | 1,310 | 6.6 | USGS | 55 | -- | -- | 190 | 27 | 42 | 5 | 140 | 440 |
| | | | | | State | 57 | 70 | 0 | 200 | 26 | 44 | 6 | 132 | 430 |
| | | | | | EPA | -- | -- | -- | 203 | 30.3 | 49.9 | 6.16 | -- | -- |
| | 02-24-88 | 10.0 | 1,230 | 7.0 | USGS | 57 | -- | -- | 180 | 27 | 30 | 5.5 | 140 | 430 |
| | | | | | State | 59 | -- | -- | 190 | 27 | 39 | 6 | 135 | 410 |
| | | | | | EPA | -- | -- | -- | 183 | 26.1 | 37.4 | 5.8 | -- | -- |
| | 04-12-88 | 15.0 | 1,410 | 6.3 | USGS | 56 | -- | -- | 220 | 33 | 49 | 7 | 160 | 520 |
| | | | | | State | 56 | 68 | 0 | 230 | 30 | 49 | 6 | 171 | 520 |
| | | | | | EPA | 50 | -- | -- | -- | 27.9 | 42.9 | 4.8 | 170 | 512 |
| PS-MW-9 (D-2-4)10bab-1 | 09-02-87 | 15.0 | 1,450 | 7.2 | USGS | 213 | -- | -- | 190 | 32 | 57 | 2.6 | 130 | 340 |
| | | | | | State | -- | -- | -- | 200 | 32 | 64 | 3 | 147 | 330 |
| | | | | | EPA | -- | -- | -- | 206 | 32.8 | 68.1 | 2.65 | -- | -- |
| | 12-02-87 | 13.0 | 1,350 | 6.7 | USGS | 130 | -- | -- | 190 | 31 | 63 | 2.6 | 150 | 330 |
| | | | | | State | 218 | 266 | 0 | 210 | 33 | 60 | 3 | 135 | 340 |
| | | | | | EPA | -- | -- | -- | 164 | 26.8 | 48.7 | 2.19 | -- | -- |
| | 02=25-88 | 8.0 | 1,260 | 7.1 | USGS | | | | | | | | | |
| | | | | | State | 196 | -- | -- | 170 | 30 | 50 | 2 | 170 | 270 |
| | | | | | EPA | -- | -- | -- | 173 | 29.1 | 47.4 | 1.9 | -- | -- |
| | 04-13-88 | 11.0 | 1,500 | 7.2 | USGS | 213 | -- | -- | 210 | 38 | 64 | 2.3 | 220 | 390 |
| | | | | | State | 212 | 259 | 0 | 220 | 37 | 66 | 2 | 227.5 | 330 |
| | | | | | EPA | 195 | -- | -- | 200 | 33.6 | 59 | 1.6 | 207 | -- |

| Aluminum, dissolved (µg/L as Al) | Arsenic, dissolved (µg/L as As) | Barium, dissolved (µg/L as Ba) | Beryllium, dissolved (µg/L) as Be) | Cadmium, dissolved (µg/L as Cd) | Chromium, dissolved (µg/L as Cr) | Cobalt, dissolved (µg/L as Co) | Copper, dissolved (µg/L as Cu) | Cyanide, Total (µg/L as Cn) | Iron, dissolved (µg/L as Fe) | Lead, dissolved (µg/L as Pb) | Manganese, dissolved (µg/L as Mn) | Mercury, dissolved (µg/L as Hg) | Nickel, dissolved (µg/L as Ni) | Silver, dissolved (µg/L as Ag) | Zinc, dissolved (µg/L as Zn) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | <1 | 29 | <0.5 | 8 | <5 | <3 | <10 | -- | 45 | <10 | 250 | -- | 10 | <1 | 2,000 |
| <400 | <1.5 | 21 | <1 | 15 | <30 | <20 | <20 | <20 | <20 | <5 | 240 | <0.2 | -- | <2 | 2,000 |
| <100 | <6 | 40 | <4 | 8.1 | <9 | <7 | <17 | <10 | <100 | <2 | 248 | <0.2 | 10.2 | <7 | 2,200 |
| | | | | | | | | | | | | | | | |
| -- | 2 | 26 | <0.5 | 8 | <5 | <3 | <10 | -- | 22 | <10 | 59 | -- | 10 | <1 | 2,100 |
| <400 | <1.1 | <20 | 2 | 8 | <5 | <20 | <20 | <20 | 44 | <5 | 68.0 | 0.2 | 15.0 | <2 | 2,400 |
| 429 | 2.1 | 22 | <2 | 9.8 | <10 | <25 | <8 | <10 | 442 | 4.0 | 70 | <0.2 | <22 | <6 | 2,150 |
| | | | | | | | | | | | | | | | |
| -- | <1 | 22 | <0.5 | 9 | <5 | <3 | <10 | -- | 7 | <10 | 24 | -- | 10 | <1 | 2,100 |
| <200 | <1 | 16 | <1 | 8 | <5 | <20 | <20 | <20 | 130 | <5 | 32 | 8.3 | 15 | <2 | 2,100 |
| 150 | <3 | 88 | <4 | — | <9 | <9 | 14 | <1 | 151 | 12 | 29 | 0.4 | 7.7 | <8 | 2,180 |
| | | | | | | | | | | | | | | | |
| -- | 2 | 23 | <0.5 | 7 | <5 | <3 | <10 | -- | 6 | <10 | 7 | -- | <10 | <1 | 2,100 |
| <400 | <1.1 | 14 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | 11 | <0.2 | <10 | <2 | 2,100 |
| <100 | <2 | 18 | <2 | <5.5 | <4 | <6 | 14 | <10 | <100 | <3 | 14 | <0.2 | <11 | <5 | 2,030 |
| | | | | | | | | | | | | | | | |
| -- | 2 | 43 | <0.5 | 2 | <5 | <3 | <10 | -- | 36 | <10 | 170 | -- | <10 | 3 | 6 |
| <200 | <1 | 35 | <1 | <1 | <5 | <20 | <20 | <20 | 65 | <5 | 160 | <0.2 | <10 | <2 | 42 |
| <100 | <3 | <45 | <4 | <0.5 | <9 | <9 | <12 | <1 | <100 | 3.4 | 162 | <0.2 | <7 | <8 | <20 |
| | | | | | | | | | | | | | | | |
| -- | 3 | 53 | <0.5 | 3 | <5 | <3 | <10 | -- | 29 | <10 | 430 | -- | <10 | <1 | 3 |
| <400 | <1.1 | 46 | <1 | <1 | <5 | <20 | <20 | <20 | 26 | <5 | 420 | <0.2 | <10 | <2 | <20 |
| <100 | <2 | 39 | <2 | <1.1 | <4 | <6 | <9 | <10 | <100 | 5.4 | 383 | <0.2 | <11 | <5 | 8.1 |
| | | | | | | | | | | | | | | | |
| -- | 1 | 32 | <0.5 | 20 | <5 | <3 | <10 | -- | 36 | <10 | 430 | -- | <10 | <1 | 2,900 |
| <400 | <1.1 | 23 | <1 | 29 | <30 | <20 | <20 | <20 | <20 | <5 | 420 | <0.2 | -- | <2 | 2,800 |
| <100 | <6 | 40 | <4 | 17.9 | <9 | <7 | <17 | <10 | <100 | <2 | 441 | <0.2 | 8.0 | <7 | 3,210 |
| | | | | | | | | | | | | | | | |
| -- | 1 | 22 | <0.5 | 15 | <5 | <3 | 10 | -- | 11 | <10 | 430 | -- | 10 | <1 | 2,600 |
| <400 | <1.1 | 21 | <1 | 12 | <5 | <20 | <20 | <20 | 20 | <5 | 430 | 0.25 | 10.0 | <2 | 2,700 |
| <90 | 3.8 | 24 | <2 | 16 | 15 | <25 | <8 | <10 | 21 | 9.3 | 472 | <0.2 | <22 | <6 | 2,890 |
| | | | | | | | | | | | | | | | |
| -- | <2 | 24 | <0.5 | 16 | <5 | <3 | <10 | -- | 9 | <10 | 110 | -- | 10 | <1 | 2,100 |
| <200 | <1 | 17 | <1 | 14 | 14 | <20 | <20 | <20 | 22 | <5 | 110 | <0.2 | <10 | <2 | 2,100 |
| <100 | <3 | <45 | <4 | — | <9 | <9 | 19 | <1 | <100 | 2.9 | 114 | 0.3 | <7 | <8 | 2,160 |
| | | | | | | | | | | | | | | | |
| -- | <1 | 29 | <0.5 | 22 | <5 | <3 | <10 | -- | 77 | <10 | 130 | -- | <10 | <1 | 3,000 |
| <400 | <1.1 | 22 | <1 | 22 | <5 | <20 | <20 | <20 | <20 | <5 | 120 | <0.2 | <10 | <2 | 2,900 |
| <100 | <2 | 20 | <2 | 20 | <4 | <6 | 15 | 14 | <100 | <3 | 115 | <0.2 | <11 | 6.7 | 2,780 |
| | | | | | | | | | | | | | | | |
| -- | 5 | 54 | <0.5 | <1 | <5 | <3 | <10 | -- | 230 | <10 | 1,600 | -- | <10 | <1 | 10 |
| <400 | 6.5 | 53 | <1 | <1 | <30 | <20 | <20 | <20 | 50 | <5 | 1,200 | <0.2 | -- | <2 | <15 |
| <100 | <6 | 57.4 | <4 | <4 | <9 | <7 | <17 | <10 | <100 | <20 | 1,290 | <0.2 | <6 | <7 | 7.7 |
| | | | | | | | | | | | | | | | |
| -- | 5 | 68 | <0.5 | <1 | <5 | <3 | <10 | -- | 65 | <10 | 1,300 | -- | <10 | <10 | 7 |
| <400 | 5.0 | 50 | <1 | <5 | <5 | <20 | <20 | <20 | 26 | <5 | 1,500 | 0.2 | <10 | <2 | <20 |
| 123 | 3.4 | 43 | <2 | 0.2 | <10 | <25 | <8 | <10 | 476 | 7.4 | 1,400 | <0.2 | <22 | <6 | 16 |
| | | | | | | | | | | | | | | | |
| <200 | 2 | 35 | <1 | <1 | <5 | <20 | <20 | <20 | 610 | <5 | 850 | 0.3 | <10 | <2 | 51 |
| <100 | <3 | <45 | <4 | — | <9 | <9 | <12 | <1 | 595 | 6.3 | 889 | 0.3 | <7 | <8 | <20 |
| | | | | | | | | | | | | | | | |
| -- | 4 | 52 | <0.5 | 2 | <5 | <3 | <10 | -- | 950 | <10 | 1,200 | -- | <10 | 1 | 6 |
| <400 | 2.5 | 43 | <1 | <1 | <5 | <20 | <20 | <20 | 950 | <5 | 1,100 | <0.2 | <10 | <2 | <20 |
| <100 | 2.4 | 40 | <2 | <1.1 | <4 | <6 | 23 | <10 | 918 | <3 | 1,100 | <0.2 | <11 | <5 | 16 |

| Location | Date of sample | Temperature, field (°C) | Specific conductance, field (µS/cm) | pH, field (units) | Reporting agency | Alkalinity, lab (mg/L as $CaCO_3$) | Bicarbonate (mg/L) | Carbonate (mg/L) | Calcium, dissolved (mg/L as Ca) | Magnesium, dissolved (mg/L as Mg) | Sodium, dissolved (mg/L as Na) | Potassium, dissolved (mg/L as K) | Chloride, dissolved (mg/L as Cl) | Sulfate, dissolved (mg/L as $SO_4$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PS-MW-10 (D-2-4)3dcd-1 | 09-03-87 | 14.0 | 1,120 | 7.3 | USGS | 230 | -- | -- | 140 | 35 | 46 | 2.7 | 90 | 230 |
| | | | | | State | -- | -- | -- | 130 | 36 | 45 | 3 | 92.4 | 230 |
| | | | | | EPA | -- | -- | -- | 140 | 36.3 | 46.9 | 3.13 | -- | -- |
| | 12-02-87 | 10.0 | 965 | 7.1 | USGS | 222 | -- | -- | 130 | 37 | 38 | 1.9 | 100 | 190 |
| | | | | | State | 223 | 272 | 0 | 130 | 39 | 41 | 2 | 83.9 | 84 |
| | | | | | EPA | -- | -- | - | 131 | 38.5 | 40.9 | 1.95 | -- | -- |
| | 02-26-88 | 8.0 | 940 | 7.2 | USGS | | | | | | | | | |
| | | | | | State | 203 | -- | -- | 120 | 35 | 35 | 2 | 101 | 160 |
| | | | | | EPA | -- | -- | -- | 113 | 32.8 | 33.8 | 1.2 | -- | -- |
| | 04-13-88 | 7.0 | 1,130 | 7.2 | USGS | 229 | -- | -- | 150 | 41 | 43 | 2.2 | 110 | 260 |
| | | | | | State | 227 | 277 | 0 | 150 | 41 | 43 | 2 | 115 | 250 |
| | | | | | EPA | 215 | -- | -- | 141 | 38.8 | 40.9 | 1.3 | 95 | 251 |
| PS-MW-11 (D-2-4)3ccd-1 | 09-03-87 | 11.5 | 1,920 | 6.7 | USGS | 264 | -- | -- | 290 | 57 | 44 | 2.1 | 160 | 520 |
| | | | | | State | -- | -- | -- | 320 | 59 | 42 | 2 | 155 | 500 |
| | | | | | EPA | -- | -- | -- | 330 | 58.8 | 44.6 | 1.88 | -- | -- |
| | 12-02-87 | 10.0 | 1,370 | 6.8 | USGS | | | | | | | | | |
| | | | | | State | 200 | 244 | 0 | 220 | 38 | 35 | 2 | 170 | 300 |
| | | | | | EPA | -- | -- | -- | 204 | 38.1 | 34.3 | 1.93 | -- | -- |
| | 02-26-88 | 7.0 | 1,260 | 6.5 | USGS | | | | | | | | | |
| | | | | | State | 170 | -- | -- | 92 | 24 | 16 | 1 | 38.9 | 130 |
| | | | | | EPA | -- | -- | -- | 88.8 | 22.8 | 14.7 | 1.2 | -- | -- |
| | 04-14-88 | 9.0 | 1,220 | 6.5 | USGS | 172 | -- | -- | 180 | 35 | 28 | 1.5 | 180 | 250 |
| | | | | | State | 170 | 208 | 0 | 190 | 34 | 28 | 2 | 187.5 | 240 |
| | | | | | EPA | 160 | -- | -- | 165 | 30.2 | 24.2 | 0.5 | 167 | 244 |
| PS-MW-11d (D-2-4)3cdc-1 | 02-26-88 | 9.0 | 648 | 7.6 | USGS | 166 | -- | -- | 95 | 24 | 16 | 1.6 | 38 | 130 |
| | | | | | State | 170 | -- | -- | 92 | 24 | 16 | 1 | 38.9 | 130 |
| | | | | | EPA | -- | -- | -- | 88.8 | 22.8 | 14.7 | 1.2 | -- | -- |
| | 04-14-88 | 8.5 | 682 | 9.0 | USGS | 171 | -- | -- | 91 | 24 | 16 | 1.3 | 38 | 140 |
| | | | | | State | 170 | 208 | 00 | 89 | 24 | 16 | 1 | 39 | 130 |
| | | | | | EPA | -- | -- | -- | 81 | 20.9 | 13.9 | <0.5 | 35 | 122 |
| PS-MW-12 (D-2-4)9acc-1 | 08-31-87 | 13.0 | 525 | 7.8 | USGS | 92 | -- | -- | 68 | 18 | 12 | 1.1 | 40 | 85 |
| | | | | | State | -- | -- | -- | 67 | 18 | 12 | 1 | 37.5 | 83 |
| | | | | | EPA | -- | -- | -- | 64.8 | 17.6 | 11.5 | <0.5 | -- | -- |
| | 11-30-87 | 9.0 | 530 | 6.9 | USGS | | | | | | | | | |
| | | | | | State | 119 | 146 | 0 | 72 | 20 | 10 | <1 | 96.9 | 190 |
| | | | | | EPA | -- | -- | -- | 74.2 | 20.3 | 11 | 1.11 | -- | -- |
| | 02-23-88 | 8.5 | 555 | 7.6 | USGS | | | | | | | | | |
| | | | | | State | 117 | -- | -- | 73 | 19 | 10 | 1 | 37 | 94 |
| | | | | | EPA | -- | -- | -- | 67.5 | 18.1 | 9.4 | 1 | -- | -- |
| | 04-11-88 | 13.0 | 580 | 6.8 | USGS | 119 | -- | -- | 74 | 20 | 10 | 1 | 38 | 96 |
| | | | | | State | 119 | 145 | 0 | 70 | 20 | 10 | <1 | 39.5 | 90 |
| | | | | | EPA | 110 | -- | -- | 65.8 | 18.2 | 9.3 | 0.5 | 40 | -- |

water from wells and drains—Continued

| Aluminum, dissolved (µg/L as Al) | Arsenic, dissolved (µg/L as As) | Barium, dissolved (µg/L as Ba) | Beryllium, dissolved (µg/L) as Be) | Cadmium, dissolved (µg/L as Cd) | Chromium, dissolved (µg/L as Cr) | Cobalt, dissolved (µg/L as Co) | Copper, dissolved (µg/L as Cu) | Cyanide, Total (µg/L as Cn) | Iron, dissolved (µg/L as Fe) | Lead, dissolved (µg/L as Pb) | Manganese, dissolved (µg/L as Mn) | Mercury, dissolved (µg/L as Hg) | Nickel, dissolved (µg/L as Ni) | Silver, dissolved (µg/L as Ag) | Zinc, dissolved (µg/L as Zn) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | <1 | 110 | <0.5 | 7 | <5 | <3 | <10 | -- | 6 | 40 | 1,100 | -- | <10 | <1 | 1,900 |
| <400 | 28 | 110 | <1 | 7 | <30 | <20 | <20 | <20 | <20 | 30 | 1,100 | <0.2 | -- | <2 | 1,800 |
| <100 | 23.2 | 110 | <4 | 8.6 | <9 | <7 | 18.5 | <10 | <100 | 43.4 | 1,130 | <0.2 | <6 | 9.7 | 1,950 |
| -- | 11 | 93 | <0.5 | 3 | <5 | <3 | <10 | -- | 6 | 20 | 430 | -- | <10 | <1 | 650 |
| <400 | 13 | 91 | <1 | 3 | <5 | <20 | <20 | <20 | 21 | 15 | 420 | 0.2 | <10 | <2 | 680 |
| <90 | 11 | 94 | <2 | 3.8 | <10 | <25 | <8 | <10 | 28 | 22 | 442 | 0.52 | <22 | <6 | 697 |
| <200 | 11 | 75 | <1 | 2 | <5 | <20 | <20 | <20 | 28 | 15 | 380 | 14.9 | <10 | <2 | 610 |
| <100 | 9 | 88 | <4 | 8.9 | <9 | <9 | 22 | <1 | <100 | 20 | 389 | 0.2 | <7 | <8 | 614 |
| -- | 10 | 100 | <0.5 | 6 | <5 | <3 | <10 | -- | 19 | 30 | 1,300 | -- | <10 | <1 | 1,900 |
| <400 | 14 | 91 | <1 | 7 | <5 | <20 | <20 | <20 | <20 | 20 | 1,200 | 0.2 | <10 | <2 | 1,800 |
| <100 | 9.6 | 88 | <2 | 5 | 4.1 | <6 | 22 | <10 | 114 | 31 | 1,220 | <0.2 | <11 | <5 | 1,930 |
| -- | <1 | 81 | <0.5 | <1 | <5 | 6 | <10 | -- | 28 | <10 | 550 | -- | <10 | <1 | 13 |
| <400 | 1.5 | 68 | <1 | 3 | <30 | <20 | <20 | <20 | 320 | <5 | 570 | <0.2 | -- | <2 | 18.0 |
| <100 | <6 | 67.4 | <4 | <4 | <9 | <7 | <17 | <10 | <100 | <2 | 577 | <0.2 | <6 | <7 | 9.9 |
| <400 | <1.1 | 37 | <1 | <1 | <5 | <20 | 20 | <20 | <20 | <5 | 240 | 0.37 | <10 | <2 | <20 |
| 1,000 | <2 | 42 | <2 | 0.9 | <10 | <25 | <8 | <10 | -- | 5 | 320 | <0.2 | <22 | <6 | 31 |
| <200 | <1 | 29 | <1 | <1 | <5 | <20 | 23 | <20 | 120 | <5 | 140 | <0.2 | <10 | <2 | 47 |
| <100 | <3 | <45 | <4 | 1.2 | <9 | <9 | <13 | 11 | 115 | 2.9 | 141 | 0.34 | <7 | <8 | <20 |
| -- | <1 | 34 | <0.5 | <1 | <5 | <3 | <10 | -- | 3 | <10 | 130 | -- | <10 | <1 | 11 |
| <400 | <1 | 25 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | 120 | <0.2 | <10 | <2 | <20 |
| <100 | <2 | -- | <2 | <1.1 | <4 | <6 | 25 | <10 | <100 | <3 | 118 | <0.2 | <11 | <5 | 38 |
| -- | 2 | 59 | <0.5 | 2 | <5 | <3 | <10 | -- | 8 | <10 | 500 | -- | <10 | <1 | 6 |
| <200 | <1 | 52 | <1 | <1 | <5 | <20 | <20 | <20 | -- | <5 | 480 | <0.2 | <10 | <2 | 39 |
| <100 | <3 | 48 | <4 | 1.5 | <9 | <9 | <12 | <1 | <100 | 11 | 482 | 0.2 | <7 | <8 | <20 |
| -- | 2 | 60 | <0.5 | <1 | <5 | <3 | <10 | -- | 3 | <10 | 260 | -- | <10 | <1 | 3 |
| <400 | <1 | 51 | <1 | <1 | <5 | <20 | <20 | 20 | <20 | <5 | 250 | <0.2 | <10 | <2 | <20 |
| <100 | 2.6 | 56 | <2 | <1.1 | <4 | <6 | 29 | <10 | 118 | 3.1 | 244 | <0.2 | <11 | <5 | 13 |
| -- | 1 | 65 | <0.5 | <1 | <5 | <3 | <10 | -- | 10 | <10 | 39 | -- | <10 | <1 | 38 |
| <400 | <1.1 | 52 | <1 | 1 | <30 | <20 | <20 | <20 | -- | <5 | 43 | <0.2 | -- | <2 | 40 |
| 135 | <6 | 52.6 | <4 | <4 | <9 | <7 | <17 | <10 | <100 | 2.75 | 39.4 | <0.2 | <6 | 7.6 | <7 |
| <400 | 25 | 60 | <1 | 4 | <5 | <20 | <20 | <20 | <20 | <5 | 8 | 0.3 | <10 | <2 | <20 |
| 90 | <2 | 66 | <2 | 0.2 | <10 | <25 | <8 | <10 | 23 | 1.3 | 8 | 0.2 | <22 | <6 | 17 |
| <200 | 2 | 59 | <1 | 1 | <5 | <20 | <20 | <20 | 28 | <5 | <5 | <0.2 | <10 | <2 | 71 |
| <100 | <3 | 53 | <4 | <0.5 | <9 | <9 | 12 | <1 | <100 | -- | <8 | <0.2 | <7 | <8 | <20 |
| -- | 2 | 70 | <0.5 | 5 | <5 | <3 | <10 | -- | 3 | <10 | 1 | -- | <10 | <1 | 3 |
| <400 | <1 | 60 | <1 | <1 | <5 | <20 | <20 | <20 | <20 | <5 | <5 | <0.2 | <10 | <2 | <20 |
| <100 | 2.7 | 57 | <2 | <1.1 | <4 | <6 | 10 | <10 | -- | 6.5 | <7 | <0.2 | <11 | <5 | <7 |

Table 9.—Chemical analyses of

| Location | Date of sample | Temperature, field (°C) | Specific conductance, field (µS/cm) | pH, field (units) | Reporting agency | Alkalinity, lab (mg/L as $CaCO_3$) | Bicarbonate (mg/L) | Carbonate (mg/L) | Calcium, dissolved (mg/L as Ca) | Magnesium, dissolved (mg/L as Mg) | Sodium, dissolved (mg/L as Na) | Potassium, dissolved (mg/L as K) | Chloride, dissolved (mg/L as Cl) | Sulfate, dissolved (mg/L as $SO_4$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PS-DR-1 (D-2-4)3cdd | 09-02-87 | 15.0 | 1,610 | 6.6 | USGS | 96 | -- | -- | 240 | 34 | 31 | 4.8 | 150 | 560 |
| | | | | | State | -- | -- | -- | 250 | 35 | 53 | 5 | 150 | 550 |
| | | | | | EPA | -- | -- | -- | 263 | 35.5 | 55.9 | 5.98 | -- | — |
| | 12-02-87 | 10.0 | 1,570 | 6.4 | USGS | 104 | -- | -- | — | — | -- | 4.6 | 160 | 520 |
| | | | | | State | 104 | 128 | 0 | 240 | 32 | 51 | 4 | 156 | 500 |
| | | | | | EPA | -- | -- | -- | 208 | 28.5 | 44.2 | 4.48 | -- | — |
| | 02-22-88 | 8.0 | 1,470 | 6.5 | USGS | 114 | -- | -- | 200 | 30 | 64 | 4.3 | 190 | 410 |
| | | | | | State | 114 | -- | -- | 210 | 30 | 73 | 4 | 190 | 400 |
| | | | | | EPA | -- | -- | -- | 197 | 28.7 | 66.3 | 4 | -- | — |
| | 04-13-88 | 8.0 | 1,500 | 6.4 | USGS | 91 | -- | -- | 240 | 34 | 41 | 4.5 | 170 | 520 |
| | | | | | State | 91 | 111 | 0 | 250 | 33 | 52 | 4 | 172.5 | 510 |
| | | | | | EPA | 80 | -- | -- | 215 | 32.6 | 47.3 | 3.4 | 197 | 522 |
| PS-DR-2 (D-2-4)3cdd | 09-02-87 | 16.0 | 1,070 | 6.8 | USGS | 94 | -- | -- | 150 | 39 | 15 | 2.2 | 39 | 330 |
| | | | | | State | -- | -- | -- | 150 | 39 | 14 | 2 | 40.0 | 330 |
| | | | | | EPA | -- | -- | -- | 159 | 39.5 | 14.6 | 2.07 | -- | — |
| | 12-02-87 | 8.5 | 1,530 | 6.8 | USGS | | | | | | | | | |
| | | | | | State | 313 | 382 | 0 | 240 | 47 | 44 | 3 | 172 | 270 |
| | | | | | EPA | -- | -- | -- | 226 | 47.4 | 43.3 | 2.94 | -- | — |

| Aluminum, dissolved (µg/L as Al) | Arsenic, dissolved (µg/L as As) | Barium, dissolved (µg/L as Ba) | Beryllium, dissolved (µg/L) as Be) | Cadmium, dissolved (µg/L as Cd) | Chromium, dissolved (µg/L as Cr) | Cobalt, dissolved (µg/L as Co) | Copper, dissolved (µg/L as Cu) | Cyanide, Total (µg/L as Cn) | Iron, dissolved (µg/L as Fe) | Lead, dissolved (µg/L as Pb) | Manganese, dissolved (µg/L as Mn) | Mercury, dissolved (µg/L as Hg) | Nickel, dissolved (µg/L as Ni) | Silver, dissolved (µg/L as Ag) | Zinc, dissolved (µg/L as Zn) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | 1 | 33 | <0.5 | 18 | <5 | <3 | <10 | -- | 740 | <10 | 1,000 | -- | <10 | <1 | 3,600 |
| <400 | 13.5 | 25 | 1 | 32 | <30 | <20 | <20 | <20 | 860 | <5 | 980 | <0.2 | -- | <2 | 3,500 |
| <100 | 7.59 | 40 | <4 | 18.6 | <9 | <7 | 18.5 | <10 | 750 | <2 | 1,050 | <0.2 | <6 | <7 | 3,980 |
| | | | | | | | | | | | | | | | |
| -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| <400 | 5.5 | 21 | <1 | 15 | <5 | <20 | <20 | <20 | 290 | <5 | 630 | <0.2 | 10 | <2 | 2,700 |
| 94 | 3.9 | 20 | <2 | 27 | <10 | <25 | <8 | <10 | 301 | 7 | 574 | 0.2 | <22 | <6 | 2,460 |
| | | | | | | | | | | | | | | | |
| -- | 7 | 27 | <0.5 | 11 | <5 | <3 | <10 | - | 470 | <10 | 890 | -- | <10 | <1 | 2,000 |
| <200 | 7 | 22 | <1 | 8 | <5 | <20 | <20 | <20 | 480 | <5 | 840 | <0.2 | <10 | <2 | 1,900 |
| <100 | 5.2 | <45 | 4 | 24 | <9 | <9 | 16 | <1 | 491 | 11 | 875 | 0.3 | <7 | <8 | 2,050 |
| | | | | | | | | | | | | | | | |
| -- | 2 | 27 | <0.5 | 19 | <5 | <3 | <10 | -- | 120 | <10 | 560 | -- | <10 | <1 | 3,000 |
| <400 | <1 | 18 | <1 | 19 | <5 | <20 | <20 | <20 | 120 | <5 | 530 | <0.2 | <10 | <2 | 2,800 |
| <100 | <2 | 16 | <2 | 12 | 5 | <6 | 19 | <10 | 287 | 4.4 | 531 | <0.2 | <11 | <5 | 2,860 |
| | | | | | | | | | | | | | | | |
| -- | 10 | 56 | <0.5 | 1 | <5 | <3 | <10 | -- | 1,800 | <10 | 560 | -- | <10 | <2 | 130 |
| <400 | 4.5 | 50 | 2 | — | <30 | <20 | <20 | <20 | -- | <5 | 560 | <0.2 | -- | <2 | 450 |
| <100 | <6 | 49.9 | <4 | <4 | <9 | <7 | 17.5 | <10 | 1,860 | <2 | 575 | <0.2 | <6 | 8.7 | 116 |
| | | | | | | | | | | | | | | | |
| <400 | 7.5 | 69 | <1 | 1 | <5 | <20 | <20 | <20 | 6,100 | <5 | 2,000 | <0.2 | <10 | <2 | 240 |
| 90 | 7.8 | 81 | <2 | 1.5 | <10 | <25 | <8 | <10 | 6,510 | 5.1 | 2,190 | 0.2 | <22 | <6 | 245 |

Table 10.—Chemical analyses of total recoverable metals from tailings
[Constituents in parts per million; USGS, U.S. Geological Survey; State, Utah Department of Health; >, greater than]

| Location: | PS-MW-3 | PS-MW-5 | PS-MW-5 |
|---|---|---|---|
| Tailings Interval: | 1.0-2.0 ft | 1.0-1.5 ft | 4.5-5.5 ft |
| | State | State | State |
| Arsenic | 380 | 410 | 480 |
| Barium | 210 | 94 | 57 |
| Cadmium | 190 | 83 | 88 |
| Chromium | 57 | 36 | 31 |
| Copper | 710 | 680 | 570 |
| Iron | 22,000 | 20,000 | 17,000 |
| Lead | 13,000 | 6,800 | 9,300 |
| Manganese | 2,000 | 2,100 | 2,400 |
| Mercury | 3.7 | 4.5 | 4.3 |
| Silver | 67 | 52 | 57 |
| Zinc | 23,000 | 16,000 | 17,000 |

| Location: | PS-MW-5 | | PS-MW-5 | PS-MW-9 | |
|---|---|---|---|---|---|
| Tailings Interval: | 5.5-7.0 ft | | 7.5-9.0 ft | 1.5-2.0 ft | |
| | USGS | State | State | USGS | State |
| Arsenic | 470 | 380 | 400 | 390 | 460 |
| Barium | 290 | 59 | 120 | 300 | 14 |
| Cadmium | 77 | 92 | 82 | 60 | 220 |
| Chromium | 53 | 32 | 33 | 55 | 35 |
| Copper | 840 | 540 | 660 | 9 | 490 |
| Iron | — | 22,000 | 16,000 | 32,000 | >72,000 |
| Lead | 9,400 | 7,000 | 7,700 | 6,700 | 8,500 |
| Manganese | 2,300 | 1,900 | 2,100 | 2,100 | 2,000 |
| Mercury | 13 | 2.3 | 3.8 | — | 0.8 |
| Silver | 68 | 59 | 55 | 50 | 59 |
| Zinc | 18,000 | 15,000 | 15,000 | 13,000 | 31,000 |

Table 10.—Chemical analyses of total recoverable metals from tailings—Continued

| Location: | PS-MW-9 | | PS-MW-9 | |
|---|---|---|---|---|
| Tailings Interval: | 2.4-3.0 ft | | 3.0-4.0 ft | |
| | USGS | State | USGS | State |
| Arsenic | 500 | 530 | 450 | 430 |
| Barium | 39 | 18 | 27 | 66 |
| Cadmium | 110 | 130 | 180 | 77 |
| Chromium | 42 | 29 | 39 | 33 |
| Copper | 23 | 730 | 29 | 630 |
| Iron | 100,000 | >76,000 | 120,000 | 34,000 |
| Lead | 8,700 | 9,400 | 9,800 | 8,300 |
| Manganese | 2,100 | 1,800 | 1,900 | 1,900 |
| Mercury | — | 3.0 | — | 4.5 |
| Silver | 55 | 53 | 65 | 50 |
| Zinc | 23,000 | 19,000 | 34,000 | 13,000 |

TABLE 11
STATISTICAL EVALUATION
ROUND I - ARSENIC
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | <1 | <1.1 | <6 |
| MW1D | <1 | <1.1 | <6 |
| MW12 | <1 | <1.12 | <6 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | <1 | <1.1 | <6 |
| MW3 | <1 | <1.1 | <6 |
| MW4 | <1 | <1.1 | <6 |
| MW5 | <1 | 1.2 | <6 |
| MW6 | <1 | <1.2 | <6 |
| MW7 | <1 | <1.5 | <6 |
| MW8 | <1 | <1.1 | <6 |
| MW9 | 5 | 6.5 | <6 |
| MW11 | <1 | 1.5 | <6 |

USGS

Detection Limit Used as Such
T* = 1.000
Tc = 1.86
Not Significant

Detection Limit = 1/2
T* = 1.000
Tc = 1.86
Not Significant

STATE

Detection Limit Used as Such
T* = 1.1966
Tc = 1.8601
Not Significant

Detection Limit = 1/2
T* = 1.3289
Tc = 1.8600
Not Significant

EPA

Detection Limit Used as Such
No Data Variability - Not Significant

Detection Limit = 1/2
No Data Variability

ROUND I - CADMIUM
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | <1 | <1 | <4 |
| MW1D | <1 | *19 | <4 |
| MW12 | <1 | 1 | <4 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | <1 | 1 | <4 |
| MW3 | <1 | <1 | <4 |
| MW4 | 5 | 6 | 6.4 |
| MW5 | 6 | *39 | 7.1 |
| MW6 | 6 | *355 | 5.9 |
| MW7 | 8 | 15 | 8.1 |
| MW8 | 20 | 29 | 17.9 |
| MW9 | <1 | <1 | <4 |
| MW11 | <1 | 3 | <4 |

USGS

Detection Limit Used as Such
T* = 2.1838
Tc = 1.8600
Significant

Detection Limit = 1/2
T* = 2.2521
Tc = 1.8600
Significant

STATE

Not Enough Data to Do the Statistical Calculations

EPA

Detection Limit Used as Such
T* = 1.9093
Tc = 1.8600
Significant

Detection Limit = 1/2
T* = 2.2957
Tc = 1.8600
Significant

ROUND I - CHROMIUM
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | <5 | <30 | <9 |
| MW1D | <5 | <30 | <9 |
| MW12 | <5 | <30 | <9 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | <5 | <30 | <9 |
| MW3 | <5 | <30 | <9 |
| MW4 | <5 | <30 | <9 |
| MW5 | <5 | <30 | <9 |
| MW6 | <5 | <30 | <9 |
| MW7 | <5 | <30 | <9 |
| MW8 | <5 | <30 | <9 |
| MW9 | <5 | <30 | <9 |
| MW11 | <5 | <30 | <9 |

USGS

Detection Limit Used as Such
No Data Variability
Not significant

Detection Limit = 1/2
No Data Variability
Not significant

STATE

Detection Limit Used as Such
No Data Variability
Not significant

Detection Limit = 1/2
No Data Variability
Not significant

EPA

Detection Limit Used as Such
No Data Variability
Not significant

Detection Limit = 1/2
No Data Variability
Not significant

ROUND I - MANGANESE
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | 110 | 94 | 99.1 |
| MW1D | 460 | 430 | 434 |
| MW12 | 39 | 43 | 39.4 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | 110 | 110 | 79.7 |
| MW3 | 6 | 8 | 8.8 |
| MW4 | 300 | 300 | 317 |
| MW5 | 120 | 120 | 126 |
| MW6 | 440 | 440 | 456 |
| MW7 | 250 | 240 | 248 |
| MW8 | 430 | 420 | 441 |
| MW9 | 1300 | 1500 | 1400 |
| MW11 | 550 | 570 | 577 |

USGS

All Values Above Detection Limit
T* = 1.0211
Tc = 2.3977
Not Significant

STATE

All Values Above Detection Limit
T* = 1.1618
Tc = 2.2848
Not Significant

EPA

All Values Above Detection Limit
T* = 1.1585
Tc = 2.3236
Not Significant

ROUND I - ZINC
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | 19 | 25 | 22.5 |
| MW1D | 12 | 19 | <7 |
| MW12 | 38 | 40 | <7 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | 30 | 26 | <7 |
| MW3 | 6 | <15 | <7 |
| MW4 | 1800 | 1700 | 1940 |
| MW5 | 2300 | 2100 | 2460 |
| MW6 | 1100 | 1100 | 1210 |
| MW7 | 2000 | 2000 | 2200 |
| MW8 | 2900 | 2800 | 3210 |
| MW9 | 10 | <15 | 7.7 |
| MW11 | 13 | 18 | 9.9 |

<u>USGS</u>

All Values Above Detection Limit
T* = 2.870
Tc = 1.8604
Significant

<u>STATE</u>

Detection Limit Used as Such
T* = 2.8766
Tc = 1.8603
Significant

Detection Limit = 1/2
T* = 2.8673
Tc = 1.8603
Significant

<u>EPA</u>

Detection Limit Used As Such
T* = 2.8774
Tc = 1.8602
Significant

Detection Limit = 1/2
T* = 2.8790
Tc = 1.8602
Significant

ROUND II - ARSENIC
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | <1.1 | <2 |
| MW1D | N/A | <1.1 | <2 |
| MW12 | N/A | 25 | <2 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | N/A | <1.1 | <2 |
| MW3 | N/A | 1.1 | <2 |
| MW4 | N/A | <1.1 | <2 |
| MW5 | 1 | <1.1 | <2 |
| MW6 | 1 | <1.1 | <2 |
| MW7 | 2 | <1.1 | 2.1 |
| MW8 | 1 | <1.1 | 3.8 |
| MW9 | 5 | 5 | 3.4 |
| MW11 | N/A | <1.1 | <2 |

USGS

Not Enough Data

STATE

Detection Limit Used as Such
T* = 0.9442
Tc = 2.9169
Not Significant

Detection Limit = 1/2
T* = 0.9302
Tc = 2.9162
Not Significant

EPA

Detection Limit Used As Such
T* = 1.5556
Tc = 1.8600
Not Significant

Detection Limit = 1/2
T* = 1.8418
Tc = 1.8600
Not Significant

N/A = No Sample was collected for analysis.

ROUND II - CADMIUM
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | *175 | 0.7 |
| MW1D | N/A | *75 | 1.3 |
| MW12 | N/A | 4 | 0.2 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | N/A | *80 | 0.4 |
| MW3 | N/A | *35 | 0.2 |
| MW4 | N/A | 3 | 3.2 |
| MW5 | 3 | *35 | 3.1 |
| MW6 | 7 | *355 | 5.8 |
| MW7 | 8 | 8 | 9.8 |
| MW8 | 15 | 12 | 16 |
| MW9 | <1 | <5 | 0.2 |
| MW11 | N/A | <1 | 0.9 |

N/A = No Sample was collected for analysis

USGS
Not Enough Data

STATE
Not Enough Data

EPA
All Values Above Detection Limit
T* = 2.0099
Tc = 1.8922
Significant

ROUND II - CHROMIUM
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | <5 | <10 |
| MW1D | N/A | <5 | <10 |
| MW12 | N/A | <5 | <10 |

USGS
Not Enough Data

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | N/A | <5 | <10 |
| MW3 | N/A | <5 | <10 |
| MW4 | N/A | <5 | <10 |
| MW5 | <5 | <5 | <10 |
| MW6 | <5 | <5 | <10 |
| MW7 | <5 | <5 | <10 |
| MW8 | <5 | <5 | 15 |
| MW9 | <5 | <5 | <10 |
| MW11 | N/A | <5 | <10 |

STATE
No Data Variability
Not Significant

EPA
No Data Variability
Not Significant

N/A - No Sample was collected for analysis.

ROUND II - MANGANESE
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | 90 | 99 |
| MW1D | N/A | 75 | 80 |
| MW12 | N/A | 8 | 8 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | N/A | 30 | 20 |
| MW3 | N/A | 6 | 5 |
| MW4 | N/A | 1800 | 2250 |
| MW5 | 260 | 260 | 276 |
| MW6 | 270 | 280 | 287 |
| MW7 | 59 | 68 | 70 |
| MW8 | 430 | 430 | 472 |
| MW9 | 1300 | 1500 | 1400 |
| MW11 | N/A | 240 | 320 |

<u>USGS</u>
Not Enough Data

<u>STATE</u>
All Values Above Detection Limits
T* = 2.0450
Tc = 1.8736
Significant

<u>EPA</u>
All Values Above Detection Limit
T* = 1.9788
Tc = 1.8725
Significant

N/A = No Sample was collected for analysis.

ROUND II - ZINC
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | 69 | 71 |
| MW1D | N/A | <20 | 85 |
| MW12 | N/A | <20 | 17 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | N/A | 41 | 22 |
| MW3 | N/A | 20 | 16 |
| MW4 | N/A | 640 | 759 |
| MW5 | 880 | 930 | 899 |
| MW6 | 1200 | 1400 | 1300 |
| MW7 | 2100 | 2400 | 2150 |
| MW8 | 2600 | 2700 | 2890 |
| MW9 | 7 | <20 | 16 |
| MW11 | N/A | <20 | 31 |

N/A = No sample was collected for analysis.

USGS
Not Enough Data

STATE
Detection Limit Used as Such
T* = 2.4806
Tc = 1.8623
Significant

Detection Limit = 1/2
T* = 2.4814
Tc = 1.8633
Significant

EPA
All Values Above Detection Limit
T* = 2.4009
Tc = 1.8637
Significant

ROUND III

Not Enough Data to Do Statistical Evaluation.
One Background Well (MW1S) Was Not Sampled.

Round III - Arsenic
All Concentrations are expressed as Ug/l

UPGRADIENT WELLS

STATISCAL EVALUATION WAS NOT DONE DUE TO INSUFFICIENT DATE

| | USGS | STATE | EPA |
|---|---|---|---|
| MW1S | N/A | N/A | N/A |
| MW1D | N/A | <1 | <3 |
| MW12 | N/A | 2 | <3 |

DOWNGRADIENT WELLS

| | USGS | STATE | EPA |
|---|---|---|---|
| MW2 | N/A | <1 | <3 |
| MW3 | N/A | <1 | <3 |
| MW4 | N/A | 1 | <3 |
| MW5 | <1 | <1 | <3 |
| MW5D | <1 | <1 | <3 |
| MW6 | 2 | <1 | <3 |
| MW7 | <1 | <1 | <3 |
| MW7D | 2 | <1 | <3 |
| MW8 | <2 | <1 | <3 |
| MW9 | N/A | 2 | <3 |
| MW11 | N/A | <1 | <3 |
| MW11D | 2 | <1 | <3 |

N/A = No sample was collected for analysis

Round III - Cadmium
All Concentrations are expressed as Ug/l

UPGRADIENT WELLS

STATISCAL EVALUATION WAS NOT DONE DUE TO INSUFFICIENT DATA

| | USGS | STATE | EPA |
|---|---|---|---|
| MW1S | N/A | N/A | N/A |
| MW1D | N/A | <1 | <0.5 |
| MW12 | N/A | 1 | <0.5 |

DOWNGRADIENT WELLS

| | | | |
|---|---|---|---|
| MW2 | N/A | <1 | 1 |
| MW3 | N/A | <1 | <0.5 |
| MW4 | N/A | 2 | 0.5 |
| MW5 | 3 | <1 | 0.5 |
| MWD | 2 | <1 | 0.5 |
| MWG | 7 | 6 | 5.4 |
| MW7 | 9 | 8 | 24 |
| MW7D | 2 | <1 | <0.5 |
| MW8 | <5 | 14 | 45 |
| MW9 | N/A | <1 | *28 |
| MW11 | N/A | <1 | 1.2 |
| MW11D | <5 | <1 | 1.5 |

N/A = No sample was collected for analysis

ROUND III - Chromium
All Concentrations are Expressed as Ug/l

UPGRADIENT WELLS

| | USGS | STATE | EPA |
|---|---|---|---|
| MW1S | N/A | N/A | N/A |
| MW1D | N/A | <5 | <9 |
| MW12 | N/A | <5 | <9 |

STATISTICAL EVALUATION WAS NOT DONE DUE TO INSUFFICIENT DATA

DOWNGRADIENT WELLS

| | USGS | STATE | EPA |
|---|---|---|---|
| MW2 | N/A | <5 | <9 |
| MW3 | N/A | <5 | <9 |
| MW4 | N/A | <5 | <9 |
| MW5 | <5 | <5 | <9 |
| MW5D | <5 | <5 | <9 |
| MW6 | <5 | <5 | <9 |
| MW7 | <5 | <5 | <9 |
| MW7D | <5 | <5 | <9 |
| MW8 | <5 | 14 | <9 |
| MW9 | N/A | <5 | <9 |
| MW11 | N/A | <5 | <9 |
| MW11D | <5 | <5 | <9 |

N/A = No sample was collected for analysis.

Round III - Manganese
All Concentrations are Expressed as Ug/l

STATISTICAL EVALUATION WAS NOT DONE DUE TO INSUFFICIENT DATA

UPGRADIENT WELLS

| | USGS | STATE | EPA |
|---|---|---|---|
| MW1S | N/A | N/A | N/A |
| MW1D | N/A | 16 | 14 |
| MW12 | N/A | <5 | <8 |

DOWNGRADIENT WELLS

| | USGS | STATE | EPA |
|---|---|---|---|
| MW2 | N/A | 64 | 80 |
| MW3 | N/A | 7 | >8 |
| MW4 | N/A | 2700 | 2750 |
| MW5 | 120 | 120 | 487 |
| MW5D | 500 | 470 | 107 |
| MW6 | 82 | 85 | 80 |
| MW7 | 24 | 32 | 29 |
| MW7D | 170 | 160 | 162 |
| MW8 | 110 | 110 | 114 |
| MW9 | N/A | 850 | 889 |
| MW11 | N/A | 140 | 141 |
| MW11D | 500 | 480 | 482 |

N/A = No sample was collected for analysis.

Round III - Zinc
All COncentrations are Expressed as Ug/l

UPGRADIENT WELLS

| | USGS | STATE | EPA |
|---|---|---|---|
| MW1S | N/A | N/A | N/A |
| MW1D | N/A | 44 | <20 |
| MW12 | N/A | 71 | <20 |

STATISICAL EVALUATION WAS NOT DONE DUE TO INSUFFICIENT DATA

DOWNGRADIENT WELLS

| | | | |
|---|---|---|---|
| MW2 | N/A | 89 | 20 |
| MW3 | N/A | 52 | <20 |
| MW4 | N/A | 400 | 361 |
| MW5 | 71 | 97 | <20 |
| MW5D | 19 | 59 | 74 |
| MW6 | 1100 | 1100 | 1060 |
| MW7 | 2100 | 2100 | 2180 |
| MW7D | 6 | 42 | <20 |
| MW8 | 2100 | 2100 | 2160 |
| MW9 | N/A | 51 | <20 |
| MW11 | N/A | 47 | <21 |
| MW11D | 6 | 39 | <20 |

N/A = No sample was collected for analysis.

ROUND IV - ARSENIC
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | <1 | <2 |
| MW1D | 1 | 1.5 | <2 |
| MW12 | 2 | 1 | 2.7 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | 2 | <1 | <2 |
| MW3 | <1 | <1.1 | <2 |
| MW4 | <1 | <1.1 | <2 |
| MW5 | <1 | <1.1 | <2 |
| MW5D | 2 | <1.1 | <2 |
| MW6 | <1 | <1.1 | <2 |
| MW7 | 2 | <1.1 | <2 |
| MW7D | 3 | <1.1 | <2 |
| MW8 | <1 | <1.1 | <2 |
| MW9 | 4 | 2.5 | 2.4 |
| MW11 | <1 | <1 | <2 |
| MW11D | 2 | <1 | 2.6 |

USGS

Not Enough Data

STATE

Detection Limit Used as Such
T* = 0.1629
Tc = 2.5417
Not Significant

Detection Limit = 1/2

T* = 0.8919
Tc = 2.6474
Not Significant

EPA

Detection Limit Used as Such
T* = 0.7952
Tc = 2.8829
Not Significant

Detection Limit = 1/2
T* = 0.6996
Tc = 2.8457
Not Significant

N/A = No sample was collected for analysis

ROUND IV - CADMIUM
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | <1 | <1.1 |
| MW1D | <3 | <1 | <1.1 |
| MW12 | 5 | <1 | <1.1 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | 3 | <1 | <1.1 |
| MW3 | <1 | <1 | <1.1 |
| MW4 | 9 | 8 | <5.5 |
| MW5 | 2 | *50 | 3.6 |
| MW5D | <1 | <1 | <1.1 |
| MW6 | 8 | 8 | <5.5 |
| MW7 | 7 | <1 | <5.5 |
| MW7D | 3 | <1 | <1.1 |
| MW8 | 22 | 22 | 20 |
| MW9 | 2 | <1 | <1.1 |
| MW11 | <1 | <1 | <1.1 |
| MW11D | <1 | <1 | <1.1 |

USGS

Not Enough Data

STATE

Detection Limit Used as Such
T* = 1.6137
Tc = 1.8120
Not Significant

Detection Limit = 1/2

T* = 1.6340
Tc = 1.8120
Not Significant

EPA

Detection Limit Used as Such
T* = 1.8467
Tc = 1.7960
Significant

Detection Limit = 1/2
T* = 1.5301
Tc = 1.7960
Not Significant

N/A = No sample was collected for analysis

ROUND IV - CHROMIUM
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | <5 | <4 |
| MW1D | <5 | <5 | <4 |
| MW12 | <5 | <5 | <4 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | <5 | <5 | <4 |
| MW3 | <5 | <5 | 4.5 |
| MW4 | <5 | <5 | <4 |
| MW5 | <5 | <5 | 5.2 |
| MW5D | <5 | <5 | <4 |
| MW6 | <5 | <5 | 5.1 |
| MW7 | <5 | <5 | <4 |
| MW7D | <5 | <5 | <4 |
| MW8 | <5 | <5 | <4 |
| MW9 | <5 | <5 | <4 |
| MW11 | <5 | <5 | <4 |
| MW11D | <5 | <5 | <4 |

N/A = No sample was collected for analysis.

USGS

Not Enough Data

STATE

No Data Variability
Not Significant

EPA

No Data Variability
Not Significant

ROUND IV - MANGANESE
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | 22 | 28 |
| MW1D | 9 | 12 | 14 |
| MW12 | 1 | <5 | <7 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | 3 | <5 | 7.3 |
| MW3 | 13 | 13 | 7.8 |
| MW4 | 46 | 46 | 44 |
| MW5 | 2 | 44 | 47 |
| MW5D | 88 | 86 | 82 |
| MW6 | *5 | 57 | 63 |
| MW7 | 7 | 11 | 14 |
| MW7D | 430 | 420 | 383 |
| MW8 | 130 | 120 | 115 |
| MW9 | 1200 | 1100 | 1100 |
| MW11 | 130 | 120 | 118 |
| MW11D | 260 | 250 | 244 |

USGS

Not Enough Data

STATE

Detection Limit Used as Such
T* = 1.9624
Tc = 1.7994
Significant

Detection Limit = 1/2

T* = 1.9676
Tc = 1.8004
Significant

EPA

Detection Limit Used as Such
T* = 1.8950
Tc = 1.8014
Significant

Detection Limit = 1/2
T* = 1.9066
Tc = 1.8031
Significant

N/A = No sample was collected for analysis

ROUND IV - ZINC
ALL CONCENTRATIONS ARE EXPRESSED AS Ug/l

UPGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW1S | N/A | <20 | 14 |
| MW1D | 5 | 20 | 48 |
| MW12 | 3 | <20 | <7 |

DOWNGRADIENT WELLS

| | USGS | State | EPA |
|---|---|---|---|
| MW2 | 3 | <20 | <7 |
| MW3 | 12 | 26 | 9.1 |
| MW4 | 2300 | 2400 | 2290 |
| MW5 | *3 | 1900 | 1780 |
| MW5D | 6 | <20 | 8.8 |
| MW6 | 1500 | 1600 | 1540 |
| MW7 | 2100 | 2100 | 2030 |
| MW7D | 3 | <20 | 8.1 |
| MW8 | 3000 | 2900 | 2780 |
| MW9 | 6 | <20 | 16 |
| MW11 | 11 | <20 | 38 |
| MW11D | 3 | <20 | 13 |

USGS
Not Enough Data

STATE
Detection Limit Used as Such
T* = 2.7090
Tc = 1.7960
Significant

Detection Limit = 1/2

T* = 2.2666
Tc = 1.7961
Significant

EPA
Detection Limit Used as Such
T* = 2.6759
Tc = 1.7978
Significant

Detection Limit = 1/2
T* = 2.6778
Tc = 1.7980
Significant

N/A = No sample was collected for analysis.

BSHW/5169z/1-21

ATTACHMENT A
DRILLING REPORT

DRAFT DRAFT

DRILLING ACTIVITIES REPORT
FOR PROSPECTOR SQUARE, PARK CITY, UTAH

The Silver Creek Tailings/Prospector Square site is located within the city limits of Park City approximately 30 miles east of Salt Lake City. The site is currently being investigated by the state of Utah and EPA through a memorandum of agreement (Appendix B). The USGS Water Resources Branch and Ecology and Environment Inc. Field Investigation Team were requested by the two principle investigators to conduct a drilling and well installation program at the site. The USGS was requested by the state of Utah to oversee well installation at the Silver Creek site, while E&E was requested to subcontract the drilling and to supervise the drilling program.

There were three phases of the drilling conducted at Prospector Square, Park City, Utah. The first phase was conducted during July 15-23, 1987. The second phase was conducted during July 27-August 5, 1987 and the third phase was conducted during August 13-21, 1987. The drilling was subcontracted to the Earth Data Acquisition Group (EDAG) of Denver, Colorado under TDD F08-8611-34D.

FIT arrived onsite July 15, 1987 at 8:00 a.m. and met with Jim Mason, United States Geological Survey (USGS) and Alton Schoonmaker of EDAG, topics of discussion were the site safety plan and proposed drilling schedule. The site safety meeting was conducted, all participants signed the release form and drilling began on PS-MW-16 at 10:30 a.m. EDAG was equipped with a CME-75 hollow stem auger rig (HSA) with a downhole hammer. Prior to commencing drilling, the USGS, in conjunction with Park City representatives had utilities checked and received final permission from Park City Engineer, Ron Ivie to drill and install wells on city property.

A. SHALLOW ALLUVIAL MONITORING WELLS

Eleven shallow monitoring wells were installed at various locations in the Prospector Square area (Figure 1). Selection of the well locations were based on professional judgment of the USGS Hydrology Branch, Salt Lake City, Utah. A summary of shallow alluvial well logs and completions is presented in Appendix A.

The objectives of installing the shallow alluvial wells were:

- o To define water table elevations, aquifer permeabilities, gradients and flow directions.
- o To document lateral and vertical extent of contamination.
- o To provide geological information on the subsurface conditions.

Installation of 11 shallow monitoring wells occurred during the three drilling periods. The following is the breakdown, including the date and type of drilling and the number of wells installed.

| DATE | TYPE OF DRILLING | WELLS INSTALLED |
|---|---|---|
| 7/15-7/23/87 | Hollow stem auger (HSA) | PS-MW-1s, PS-MW-2, PS-MW-4, PS-MW-6, PS-MW-5s, PS-MW-7 (6) |
| 7/27-8/24/87 | HSA | PS-MW-3, PS-MW-9, PS-MW-5 PS-MW-10, PS-MW-1D (5) |
| 8/13-8/21/87 | HSA w/casing advancer | PS-MW-2D, PS-MW-11 (2) Boreholes PS-BH-001, PS-BH-002 (2) |

A CME 75 hollow stem auger drilling rig was used to drill the above mentioned boreholes. The boreholes were advanced with a 7 5/8" hollow stem auger, with split spoon samples taken at 5.0' intervals unless field conditions warranted otherwise. Samples of the unconsolidated sediments were obtained using a 2', 18" or 24" split spoon barrel. Geologic descriptions of the samples were made immediately at the time of collection and a detailed geologic log was prepared. Logs are provided in Appendix A.

If a sample was collected for analysis, the sample was composited in a stainless steel bucket, the sample was placed in an 8 ounce glass jar with a teflon lined lid. The sample was labeled with the appropriate sample tag including the samples name, the date, TDD #, well number and depth. The lid was taped, the sample placed in a plastic sample bag, then placed in appropriate sample containers under chain of custody.

Drill spoils produced during the drilling program were containerized in 55 gallon drums and stored at the Summit County Landfill with permission from Ron Ivie. Spoils were containerized from all boreholes. Screening samples were collected and analyzed by the state lab for metals and E.P. toxicity.

B. DEEP ALLUVIAL WELLS

Two deep alluvial wells were installed upgradient of Prospector Square. Well locations were based on locations outlined in the USGS project proposal for Prospector Square. A summary of deep alluvial well logs and completions are presented in Appendix A.

The objectives of installing the deep alluvial wells were:

- To determine baseline water quality in the deep alluvium upgradient of Prospector Square.
- To provide geologic information of the alluvium beneath the shallow aquifer and wells.
- To determine the hydraulic gradient between the deep and shallow alluvium.

## C. TAILINGS DRILLING

In addition to shallow alluvial wells, two shallow boreholes were drilled to the base of the tailings (PS-BH-001 and PS-BH-002). The locations of the boreholes were chosen to assist in deteriming the horizontal and vertical distribution of tailings in the Prospector Square area in partial fulfillment of SARA, Section 125. The 2 shallow holes were drilled to depths of 9.6′ and 8.0′ respectively. The borings were drilled down to native material. The boreholes were backfilled with a mixture of native material and bentonite. Borehole logs are contained in Appendix A.

## D. WELL COMPLETION

Wells were constructed of 2" inside diameter Schedule 80 PVC casing with either 10 or 20 slot screen. Shallow wells were drilled approximately 15′ into the water table and a five foot section of screen was set five feet above the bottom of the well. A five-foot silt trap was installed below the screen. The annular space around the screens were backfilled with 10/20 Colorado silica sand to five feet above the screen. A minimum 2 foot bentonite seal was emplaced on the sand and hydrated. The placement of this seal was to prevent any downward migration of surface water. The annular space around the well casing was grouted with cement and 4% bentonite slurry to within 4 feet of the surface. A four feet locking steel surface casing was placed in the hole, and a neat cement surface seal was then emplaced. The casing was set flush with the ground surface.

Deep alluvial wells were installed and completed in the same manner as shallow alluvial wells except for the following procedures:

- 1 ten foot section of 20 slot screen was set at total depth without the use of a silt trap below the screen.
- Setting of the bentonite and cement seals was accomplished via a 1" tremie line.

## E. WELL DEVELOPMENT

The wells were developed by use of a Brainard-Killman pitcher pump. All wells were pumped until temperature, pH, specific conductance and flow rate were constant. Several (3-7) casing volumes of water were evacuated before chemical equilibria was obtained. All development water was containerized and stored at the county landfill pending analysis for hazardous waste characterization.

## F. DECONTAMINATION

Upon completion and development of each well, equipment used in the drilling process in as steam cleaned and rinsed with water. The steam cleaning was accomplished by using a Hotsry Steam cleaner with a soap and water mixture. The equipment was rinsed with clean water to remove any soap residue.

## G. WELL SURVEYING

At the direction of E&E, all wells and borings were surveyed to an existing benchmark for horizontal and vertical control by J.J. Johnson and Associates of Park City, Utah. Table 1 contains these data. Water level measurements were recorded subsequent to this survey by the USGS. The USGS will develop a potentiometric map showing ground water flow direction.

# DRILL LOG

PROJECT Prospector Square — TDD NO. 708-3611-34D — DATE 8-1-87
WELL/BORING PS-MW-1D — LOCATION Kearns & Homestake Blvd. Park City, UT — LOGGER H Fereny
DRILL METHOD HSA - Split Spoon Drives — PAGE ___ OF ___
WATER LEVEL FIRST ENCOUNTERED 32.2 — FINAL 33.25 — ELEV. 6791.87

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| 10–30 | | | initial ▽; ▽ Final | Fill Sand, gravelly, dry, brown. Gravel fine to coarse, sandy, clayey. Med dense to dense, brown to reddish brown, moist, with clayey lenses at 6', 13-15', 20-23', 24-26', 35' (GC) | Upper 45' was similar to the PS-MW-1A, which was logged with 9 Spl. spoon Drives. |
| 40–60 | | SS | | Sand, fine to coarse, gravelly, fine to coarse with scattered cobbles, sl. clayey, dense, moist brown (SC/SP). More gravelly at 54', 64-65', 66-67' | Recovery: 50-51.0' = 100%; SS = 30-40 |
| 70–80 | | SS; SS | | Clay, low to med. plasticity, sandy-silty, fine to coarse grained sl. gravelly to scattered gravel with cobbles, very stiff, moist to wet, brown (CL) | Recovery: 80-82' = 100%; SS = 30-6-9-10 |
| 100 | TDD | 85.5' | | Shale, reddish brown, friable (Woodside Shale); moderately hard from 85.0', moist | Recovery: 85-85.5' = 100%; SS = 160/per 3", 230/3" |

# DRILL LOG

PROJECT Prospector Square JOB NO. FO7 8611-34D DATE 7-16-87

WELL/BORING PS-MW-2 LOCATION Pacific Bridge WELL LOGGER K. Moe

DRILL METHOD HSA Split Spoon Drives PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED 31.0' FINAL 32.0 ELEV. 6758.44

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| | | | | Fill, sand gravel, cobbles | |
| | | | | Gravel, fine-coarse sandy clay medium dense moist with clay lenses cobbles to 6" | Drive 25% recovery |
| 10 | | | | | Drive 80% recovery |
| 20 | | | | | Drive 40% Recovery |
| | | | | Clay - brown-red low-medium plasticity, sandy-silt very fine-fine sand small amount gravel WELL sorted small amt silt | |
| 30 | | | Initial ▽ Final | | Drive 100% Recovery |
| 40 | | | | | Drive 50% Recovery |
| | | | | —TO 44.5' | |

# DRILL LOG

PROJECT Prospector Square | TDD NO. F08-8611-34D | DATE 8/20-21/87

WELL/BORING PS-MW-2D | LOCATION West of Corner Shop, Park City, UT | LOGGER M. Peccny

DRILL METHOD HSA, AIR ROTARY | PAGE / OF /

WATER LEVEL FIRST ENCOUNTERED 33.0' | FINAL 30.0 | ELEV.

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| 2' | | HSA cuttings | | Fill: Gravel, sandy, fine to coarse dense, dry, gray (GM) | Some fine grained silty sand, gray tailings material observed at the vicinity of the boring |
| 25 | | | Final | Gravel, fine to coarse, sandy, fine to coarse, dense, moist, brown, with cobbles (rounded to subangular) (GP) | |
| 30 | | SS 12-22 | Initial 12-22 | | Core recovery 35.0-36.5' = 100% |
| 40 | | | | Sl. clayey to clayey at 20', 25-40' to gravelly clay 40-54' (GC) | |
| 54 | | | | | |
| 60 | | | | Clay, sandy, fine to coarse, stiff, moist, brown, scattered gravel up to cobble size (CL) | |
| 71 | | | | Clay, sandy, gravelly, fine to coarse stiff, moist, brown (CL) | |
| 90 | | HSA SS | 100-200 | Gravel, sand, fine to coarse, clayey, dense, moist, brown (rounded to subangular gravel with cobbles) (GC) | Core recovery 90.0'-91.0' = 80% Bouncing |
| 97 | | AIR ROTARY | | | Start Air rotary at 93' |
| | | | | Gravelly sand to sandy gravel, (SP/GP) fine to coarse with cobbles, dense moist to wet, brown, scattered clayey lenses (106', 112-113', 117.5-118') | Water discharge at 110' 0.8 gal/min |
| 120 | | | | Some boulders of igneous rock (porphyry) and quartzite between 114-120' | 115' 1 gal/min. 120' 1.7 gal/min |
| 121.5' | TDD 125.0' | | | Shale, reddish brown, silty, fine grained, low hardness, wet, blocky | Woodside Shale |

Air Rotary Sampling at 5' interval (93' - 125')

# DRILL LOG

PROJECT Prospector Square JOB NO. FOE 2611-340 DATE 7-28-87

WELL/BORING PS- MW-3 LOCATION Highway 224 East of Park City High School LOGGER K. Moll

DRILL METHOD HSA Split Spoons PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED 22.95 FINAL 21.97 ELEV. 6743.35

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| | | | | Topsoil | Continous Drives 2.0' intervals 100% recovery |
| | | | | Fill, Sand . yellow well sorted sand limonite staining | |
| | | | | Fill Clay dark brown low plasticity w pebbles & gravel | |
| 10 | | | | Fill clay - Red - medium plasticity w pebbles & gravel angular | |
| | | | | Clay . Red medium plasticity w very fine grained Sand & pebbles rounded - angular | Drive 100% recovery |
| 20 | | | Initial | Gravel fine - course, angular - subrounded poorly sorted Moist | |
| | | | | Clay - Brown Medium - high plasticity, small amt Pebbles | Drive 80% recovery Blow counts 3-4-4 |
| 30 | | | | Gravel - as above TD 36.0' | Drive 40% recovery |

# DRILL LOG

PROJECT Prospector Square JOB NO. FOS 8611-34 D DATE 7-20-87

WELL/BORING PS-MW-4 LOCATION Prospector Square LOGGER K. Moe

DRILL METHOD HSA Split Spoon @ Silver Creek PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED 27.99 FINAL 29.2 ELEV. 6773.42

| DEPTH IN FEET | LITH CBL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| | | | | Fill Asphalt Pitch Dirt Dark brown w/ cobbles | |
| | | | | SAND - Tan - beige medium coarse well sorted and rounded | Drive 2.0' Samples |
| | | | | Gravel fine - medium, sandy, clayey - medium plasticity with fine - medium sand clay lenses throughout pebbles to 1/2" | |
| 10 | | | | | Drive 100% recovery |
| | | | | Clay - Red medium plasticity w- fine - medium sand interbedded Quartz and K-spar pebbles to 1/2" | Drive 100% recovery |
| 20 | | | | Gravel fine - coarse angular - subrounded | |
| | | | | Clay as above | |
| | | | Initial ∇ Final ∇ | Gravel, sandy fine - coarse moist | Drive 60% recovery |
| 30 | | | | NO Return | Drive 0% recovery |
| | | | | Sand Reddish - brown fine - medium rounded - subrounded with cobble, small amount clay lenses | |
| | | | | No Return | Drive 0% recovery |
| | | | | Gravel - fine - medium, poorly sorted pebbles with clay interbedded | |
| 40 | | | | | Drive 80% recovery |
| | | | | TD 45.0' | Drive 80% recovery |

# DRILL LOG

PROJECT Prospector Square  JOB NO. F08 8611-34 D  DATE 7-20-87

WELL/BORING PS-MW-5  LOCATION SIDEWINDER @ Belle Starr  LOGGER K. Moll

DRILL METHOD HSA Split Spoon  PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED 22.5  FINAL 18.0  ELEV. 6741.04

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| | | | | Fill brown dirt | Drives - 2.0' Continous |
| | | | | Sand Lt brown-tan, medium-grained well sorted, subrounded | G.L. - 8.5' |
| 7.5 | | | | Same as above, grades to coarser sand w/ gravel Tailings | |
| | | | | Gravel Cobbles to 3" Small subrounded - rounded amt silt + clay | Drive 10-12.0 60% recovery |
| | | | | Clay lens @ 12.7 | |
| 15.0 | | | | Clay - Red brown medium plasticity moist | |
| | | | Final | Clay Fat, Red highly plastic, sand + pebbles interbedded | |
| 22.5 | | | Initial | NO Return | 0% recovery |
| | | | | Gravel - cobbles to 4" rounded | 100% recovery |
| 30 | | | | Clay - Red-Brown fat highly plastic w interbedded fine - very fine sand | |
| 35 | | | | TD 34.0' | |

## DRILL LOG

PROJECT: Prospector Square — JOB NO.: F07 2611-34D — DATE: 7-20-87

WELL/BORING: PS-MW-6 — LOCATION: Doc Holiday @ Little Bessie Ave — LOGGER: K Mccc

DRILL METHOD: HSA Split Spoons — PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED: 14.0' — FINAL: 13.0' — ELEV. 6731.48

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| | | | | Dirt, dark brown, silty sand/ clay | Drives 2.0' continuous B.C 10, 11, 14, 15 |
| | | | | Gravel, sandy silt w/ cobbles rounded-subrounded | 20% recovery B.C 4, 6, 11, 25 |
| 5 | | | | clay - red silty, medium plasticity dry w cobbles | 100% recovery B.C 6, 10, 15, 20 |
| | | | | Gravel - quartzite, + serpentine chips fine - coarse rounded - subrounded good sorting, silty sand w/ small amt clay | |
| 10 | | | | SAME AS above | |
| | | | | clay - brown- red medium plasticity, moist @ 13.0', interbedded lenses v.f-f sand rounded and well sorted | Drive 14.0-16.0 60% recovery |
| 15 | | | | SAND - v.f-f, well rounded rounded good sorting with lenses of red brown clay | |
| 20 | | | | | |
| | | | | Gravel - fine - coarse, sand clayey, cobbles rounded subrounded ½"-4" | |
| 25 | | | | 30% return | |
| | | | | TD 29.0' | |

# DRILL LOG

PROJECT Prospector Square JOB NO. FOY 8611-34 0 DATE 7-20-87

WELL/BORING PS-MW-7 LOCATION Buffalo Bill Ave LOGGER K. Moll

DRILL METHOD HSA (split spoon) PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED 15.2 FINAL 12.0' ELEV. 6722.46

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| 0–3 | | | | Fill sandy, dry, brown with small amount clay | Drives 2.0' continuous G.L- 3.0' |
| 3–5 | | | | Clay - low plasticity, brown pebbles w sandy silt | |
| 5–15 | | | Final ▽ (12.0) | Gravel, coarse-fine sm amt clay cobbles w/ qtz chips. subrounded-rounded poorly sorted, 75% dk minerals dry | Drive 14.0-15.5 30% recovery |
| 15–20.5 | | | Initial ▽ (15.2) | Gravel coarse-fine, sandy clay medium plasticity, small amt silt, qtz, ss chips cobbles to 4" subangular-Rounded Poorly sorted | |
| 20.5–22 | | | | Fine-medium, fairly well sorted rounded to subrounded predominately qtz grains | |
| 22–25 | | | | Sand high plastic clay. Fat blue-grey clay wet | |

TD 25.0

# DRILL LOG

PROJECT: Prospector Square  JOB NO.: FO7 8611-34.D  DATE: 8-4-87
WELL/BORING: PS-MW-8  LOCATION: Comstock - CUL DE SAC  LOGGER: M. Peccny
DRILL METHOD: HSA Split Spoons  PAGE: 1 OF 1
WATER LEVEL FIRST ENCOUNTERED: 26.6  FINAL:  ELEV.: 6751.41

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| | | | | Sand, gravelly fine - coarse with cobbles, well sorted dense slightly moist gray | 5-8-8-9 Blows 100% recovery |
| | | | | | 12-13-15-10 100% recovery |
| | | | | Gravel subrounded | |
| 10 | | | | sandy silt, loose dark brown fine grained - coarse | 4-5 100% recovery |
| | | | | Gravel. fine- coarse, sandy with cobbles dense moist brown silt clayey | 35-35-50-35 100% recovery |
| | | | | Clay - Low plasticity, sandy fine coarse silty loose moist brown | |
| | | | | Gravel - fine - coarse clayey low plasticity silty, moist dense brown with cobbles subangular | Drive - 100% recovery 20-40-50/5 |
| 20 | | | | silt - clayey, with gravel subangular - subrounded with sand lenses fine - coarse | Drive 100% recovery |
| | | | | Gravel - Fine - coarse with cobbles Dense, silty, sl clayey, moist brown (subangular few subrounded | |
| 30 | | | | | Drive 100% recovery 33-50 |
| 40 | | | | TD 41.0' | |

# DRILL LOG

PROJECT Prospector Square JOB NO. FOE 7611-34 0 DATE 7-29-87

WELL/BORING PS-MW-9 LOCATION City Park east of Prospector Square LOGGER K. McC

DRILL METHOD HSA Split Spoons PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED 12.0 FINAL ELEV. 6707.90

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| 0–5 | | | | Tailings. Pyrite, Arsenopyrite Minerals, SAND Fine-very fine grained well sorted + rounded | Drives 0-2.0' 2.-4.0' 4.0-6.0' 100% recovery |
| 5 | | | | clay- Dark brown organic | |
| | | | | clay- same as above | |
| 10 | | | Initial | Gravel - fine-coarse with cobbles, subrounded rounded, poorly sorted interbedded lenses of sandy clay | |
| 15 | | | | Bedrock, Shale Red friable parts at bedding planes slightly weathered<br>TD 16.5 | Drive 15.0-16.0 WOODSIDE Shale 50/6 5" |

# DRILL LOG

PROJECT Prospector Square JOB NO. FC8-8611-34 D DATE 7-31-87

WELL/BORING PS-MW-10 LOCATION Highway 224 east of Park City LOGGER K.Moll/M.Pecany

DRILL METHOD HSA Split Spoons PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED 1.5' FINAL 2.0' ELEV.

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| 0–4 | | | | Sand fine-coarse, w gravel with silty sand lense | Drives 0-4.0 100% recovery |
| 5 | | | | Gravel - fine-coarse, subrounded poorly sorted | |
| 10 | | | | Gravel - fine - coarse poorly sorted subrounded | Drive No Recovery |
| | | | | BEDROCK - Shale friable, weathered parts easily @ bedding planes. Dark Reddish brown<br>TD 13.0' | Drive 70/6 No Recovery |

# DRILL LOG

PROJECT: Prospector Square | TDD NO. F08-8611-34D | DATE 8-13-87

WELL/BORING: PS-MW-11 | LOCATION: East from High School, Park City, UT | LOGGER: M. Pacenti

DRILL METHOD: HSA + Split Spoon Drives | PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED: 2.8 | FINAL: 1.77 | ELEV.

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| 0–2 | | | ∇ Final | Fill. Sand, gravelly, loose, dry, gray with cobbles | |
| 2–7 | | | ∇ Initial | Silt, fine grained clayey, low plasticity, sl. sandy, med. dense dark brown to black, organic | |
| 7–11 | | SS | | Clay, highly plastic, sl. sandy to sandy fine grained, moist to wett, gray to dark gray | SS = 9-15-17 (per 6" each) Recovery 10.0-12.0' = 100% |
| 11–22 | TOD 22.0' | SS | | Sand, gravelly, fine to coarse, with scattered cobbles, med. dense, moist to wett, gray | SS = 9-10-12 (per 6" each) Recovery 20-22.0' = 100% |
| 22–24 | | | | | |

# DRILL LOG

PROJECT Prospector Square    TDD NO. F08-8611-34D    DATE 8-21-87

WELL/BORING PS-BH-001    LOCATION Pr. Square North    LOGGER H. Ferony

DRILL METHOD Split Spoon Drives (SS)    Park City UT    PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED Dry    FINAL Dry    ELEV.

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| | | | | TOPSOIL | |
| 1 | | SS | | Fill - Sandy gravel, fine to coarse, loose, dry, brown, organic (GP/SP) | Reworked natural soil; Recovery 0 - 2' = 100%; SS = 3-12-11-11 Blow count |
| 2–3 | | SS | | Fill - Sand, fine to coarse, silty, sl. clayey, loose to med. dense, moist, dark brown; organic to sl. organic (SP/SM) | Recovery 2.0-4.0 = 100%; SS = 6-7-14-14 |
| 4–7 | | SS | | Fill - Sand-gravel, fine to coarse, with cobbles, loose to med. dense, moist, dark brown. Some gravel with iron staining altered (unprocessed mine tailings ?) (SP/GP) | Recovery: 4.0 - 6.0 = 100%; SS = 9-5-9-9; Soil (EPA) sample 3.5 - 4.0; Soil (EPA) sample 4.0 - 5.5 |
| 7 | | SS | | Clay, highly plastic, sandy, fine grained, stiff, moist, dark brown (CH) | Recovery: 6.0 - 7.6 = 100%; SS = 6-6-30 |
| 8–9 | | SS | | Fill: Sand, gravelly, fine to coarse as above, rounded to angular SP/GP | SS = 45-30-45-30; Recovery 7.6 - 9.6 = 100% |
| 10 | | TDD 9.6' | | Clay - as above | |
| | | | | Gravel fine to coarse, sandy, clayey, dense, moist, brown, with cobbles | Note: Hole was backfilled with natural soil and road gravel |

# DRILL LOG

PROJECT Prospector Square TDD NO. F08-8611-34D DATE 8-21-87

WELL/BORING PS-BH-002 LOCATION P. Square-South East LOGGER M. Pecenka

DRILL METHOD Split Spoon Drives (SS) Park City, UT PAGE ___ OF 1

WATER LEVEL FIRST ENCOUNTERED Dry FINAL Dry ELEV. ___

| DEPTH IN FEET | LITH COL | SAMPLE TYPE IDENT. | MOISTURE CONTENT WATER LEVEL | LITHOLOGIC DESCRIPTION | NOTES |
|---|---|---|---|---|---|
| 0–1 | | SS | | TOPSOIL Clay, sand, silt, dry, gray<br>Tailings:<br>Sand, fine to med. grained silty to sl. silty, loose to med. dense dry to sl. moist, gray with yellowish brown (limonite) lenses rich on pyrite (at 3.5–4.0) (SM) | SS = 6-8-12-11<br>Recovery: 0-2.0' = 100% |
| 2–4 | | SS | | | SS = 6-8-10-10<br>Recovery: 2.0-4.0' = 100% |
| 4–6 | | SS | | Clay, high plasticity, sl. sandy, fine grained, stiff to med. stiff, moist, dark brown to black (5.0-6.0), lt. gray to gray (6.0-8.0) with scattered gravel up to cobble size (CH) | SS = 7-5-5-7<br>Recovery: 4.0-6.0' = 100% |
| 6–8 | | SS | | | SS = 8-10-15-20<br>Recovery: 6.0-8.0' = 100% |
| 8 | TDD | 8.0' | | | |
| 9 | | | | | |
| 10 | | | | | |

## WELL/PIEZOMETER COMPLETION DIAGRAM

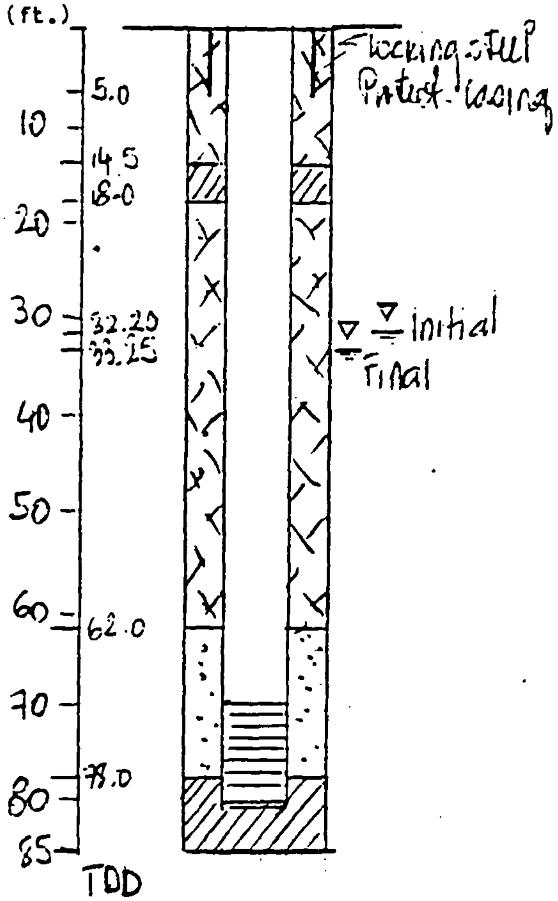
Project: Prospector Square | TDD No. F08 - 8611 - 34D

Location: Park City, UT | Well Number: PS - MW - 1D

Geologist: M. Pacenti | Date(s) of Installation: 8-1-87

Depth to Water: 33.25 feet (G.L.) | Elevation from Measuring Point: 6791.87

Depth (ft.)




DRILLING SUMMARY:

Driller: E.D G.G. - Alton Shoemaker

Rig Type: CME 75

Drilling Method: HSA

Bit(s): Tooth type

Drilling Fluid:

Surface Casing:

Hollow Stem/Drive Casing I.D. (in.): 4 1/4

Total Depth of Boring (ft.): 85.0

Borehole Diameter (in.): 7 1/4

WELL DESIGN:

Completion: ~~Above~~ Grade: at | Below Grade:

Basis: Geological Log ✓ | Geophysical Log | Type:

Total Depth of Well (ft.): 80.3'

Casing String(s): C=casing S=screen

C 80.3 - 80.0 | S 80.0 - 70.0
70.0 - 0

Casing: 2" PVC schedule 80

Screen: 2" PVC schedule 80 .010 slots

Centralizers: none

Gravel/Sand Pack: 78.0 to 62 feet
10-20 Mesh Colorado silica sand

Bentonite Seal(s): 85.0 to 78.0 feet
18.0 to 14.5 feet

Bentonite (type): 1/4" pellets

Backfill (cuttings) to feet

Cement Seal(s): 62 to 18 feet
14.5 to 0 feet

Cement Composition: 5% bentonite (Volclay) + Portland Type II Cement

Protective Casing: 5.0' to 0' feet

Protective Casing Type: 6" steel with locking cap

Other:

WELL DEVELOPMENT:

Method: Bailer

Duration: 1.5 hrs. Estimated production: 1.5 gpm

Water Appearance: Slightly muddy

Remarks:
Bedrock at 83.0 ft / Woodside Shale

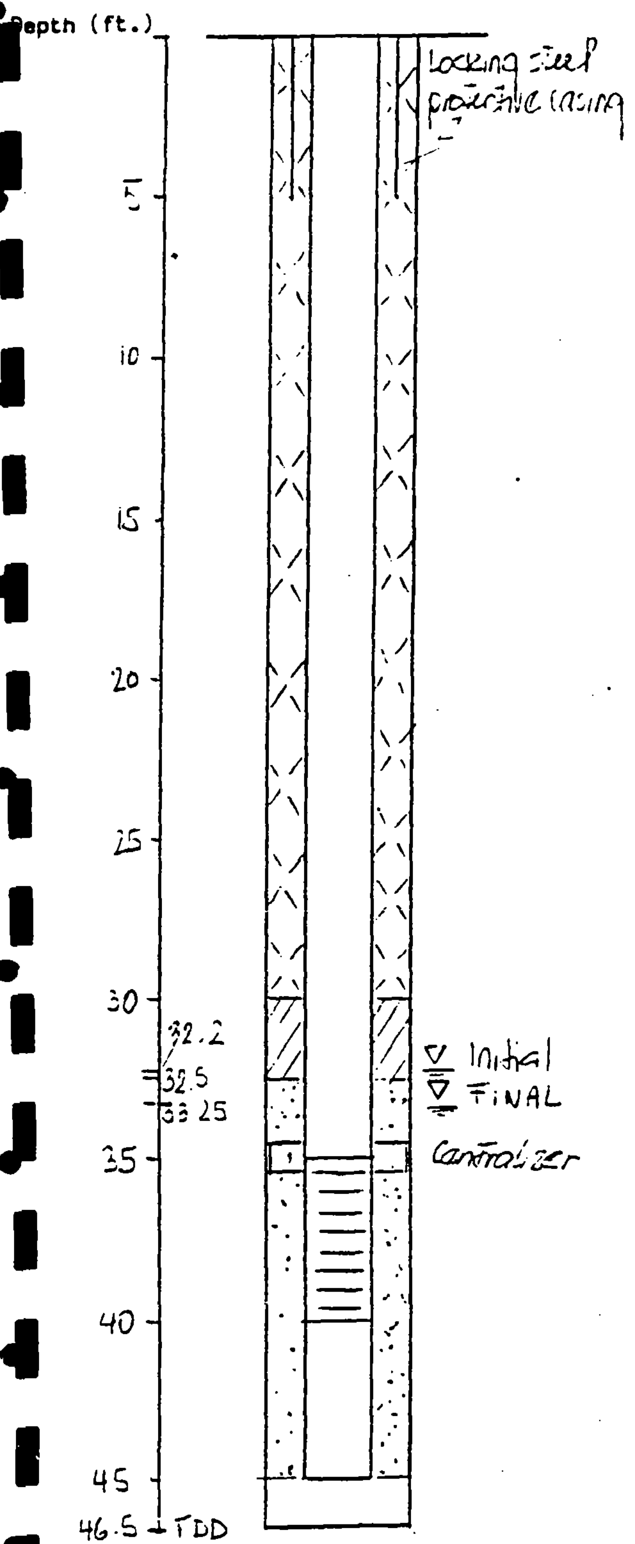
# WELL/PIEZOMETER COMPLETION DIAGRAM

Project: Baxter Square (?)      TDD No. F08 - 8611 - 34D (?)

Location: Salt Lake, UT (?)      Well Number: BS - MW - 15 (?)

Geologist: [illegible]      Date(s) of Installation: 7-15-87

Depth to Water: 33.25 feet (G.L.)      Elevation from Measuring Point: 4791.87 (?)




DRILLING SUMMARY:

Driller: Earth DAG - Alton Schoomaker (?)

Rig Type: CME 75 (?)

Drilling Method: Hollow stem auger (?)

Bit(s): [illegible]

Drilling Fluid: None

Surface Casing:

Hollow Stem/Drive Casing I.D. (in.): 4 1/4 (?)

Total Depth of Boring (ft.): 46.5 (?)

Borehole Diameter (in.): 7 3/4 (?)

WELL DESIGN:

Completion: ~~Above~~ at Grade ✓    Below Grade

Basis: Geological Log ✓    Geophysical Log

Type

Total Depth of Well (ft.): 45

Casing String(s): C=casing S=screen

| | | | | | |
|---|---|---|---|---|---|
| C | 45 - 40' | | S | 35 | 40' |
| | 45 (?) | 0' | | | |

Casing: 2" Schedule 80 PVC 10' Sections

Screen: 2" Schedule 80 PVC 0.020 slot (?)

Centralizers: 1 at 35'

Gravel/Sand Pack: 45 to 32.5 feet

10-20 Mesh Colorado silica sand (?)

Bentonite Seal(s): 32.5 to 30 feet

to feet

Bentonite (type): 1/4" pellets (?)

Backfill (cuttings): to feet

Cement Seal(s): 30.0 to 0 feet

to feet

Cement Composition: [illegible] 1400 [illegible]

Protective Casing: 1.5 (?) to 3 (?) feet

Protective Casing Type: Steel with locking cap (?)

Other:

WELL DEVELOPMENT:

Method: Hand pump (?)

Duration: 1 hrs Estimated production: 1.5 (?) gpm

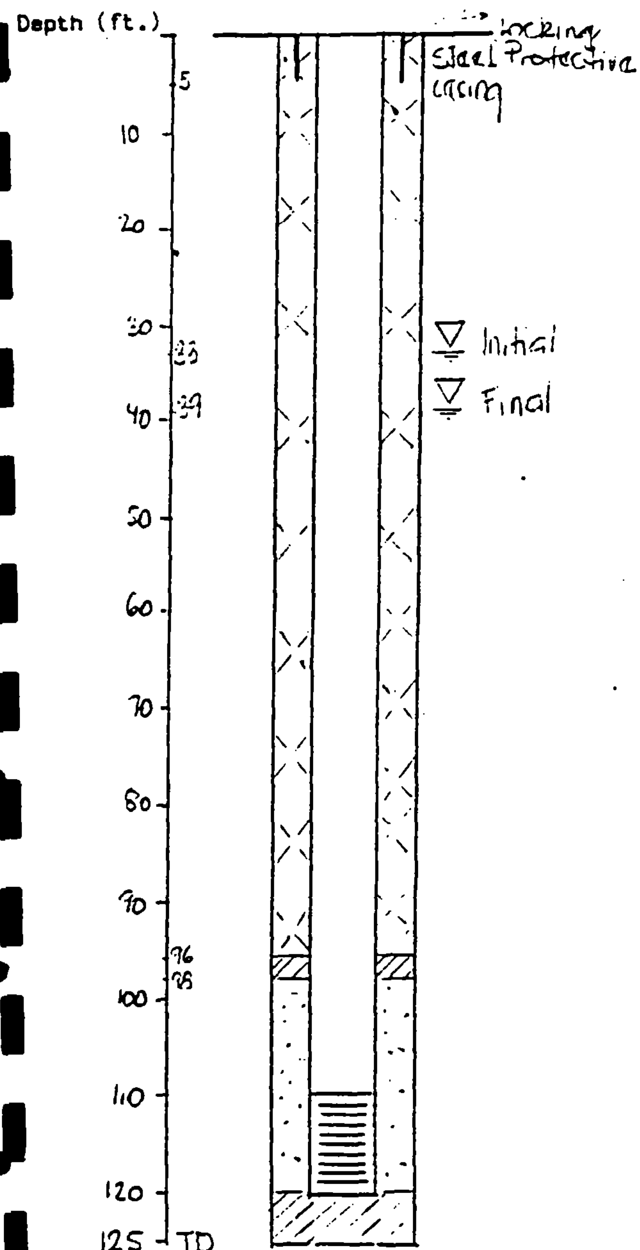
Water Appearance: [illegible] muddy [illegible]

Remarks:

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square
Location Park City, UT
Geologist M. Pdczny
Depth to Water 39.0 feet (G.L.)

TDD No. F08-8611-34D
Well Number PS-MW-2D
Date(s) of Installation 8/20-21/87
Elevation from Measuring Point




DRILLING SUMMARY:

Driller Earth Ag. Data Group (Fox E Ass.) Alton Shoomaker
Rig Type CME 75
Drilling Method HSA, AIR ROTARY
Bit(s) TOOTH-TYPE; TRICONE TYPE
Drilling Fluid None

Surface Casing
Hollow Stem/Drive Casing I.D. (in.) 4 1/4"/6 5/8"
Total Depth of Boring (ft.) 125
Borehole Diameter (in.) 8"

WELL DESIGN:

Completion ~~Above~~ at Grade  Below Grade
Basis: Geological Log ✓ Geophysical Log
Type
Total Depth of Well (ft.) 120.4
Casing String(s): C=casing S=screen
C 120.4 - 120 | S 120 - 110
110 - 0

Casing: PVC 2", schedule 80, 10' sections
Screen: PVC 2" schedule 80. .010 slots

Centralizers none
Gravel/Sand Pack 120 to 98 feet
Colorado Silica Sand 10-20 Mesh
Bentonite Seal(s) 98 to 96 feet
120 to 125 feet
Bentonite (type) 1/4" Bentonite Pellets
Backfill (cuttings) NA to feet
Cement Seal(s) 0 to 96 feet
to feet
Cement Composition Portland T II / Bentonite (grout) Slurry
Protective Casing 0 to 5 feet
Protective Casing Type Steel 6 5/8"

Other

WELL DEVELOPMENT:

Method Hand Pump, Air Lift

Duration 2 hrs Estimated production 1.5 gpm
Water Appearance Slightly muddy

Remarks: water discharge was measured through drilling from 110-120' deep zone with an average 0.8 - 1.7 gpm

# WELL/PIEZOMETER COMPLETION DIAGRAM

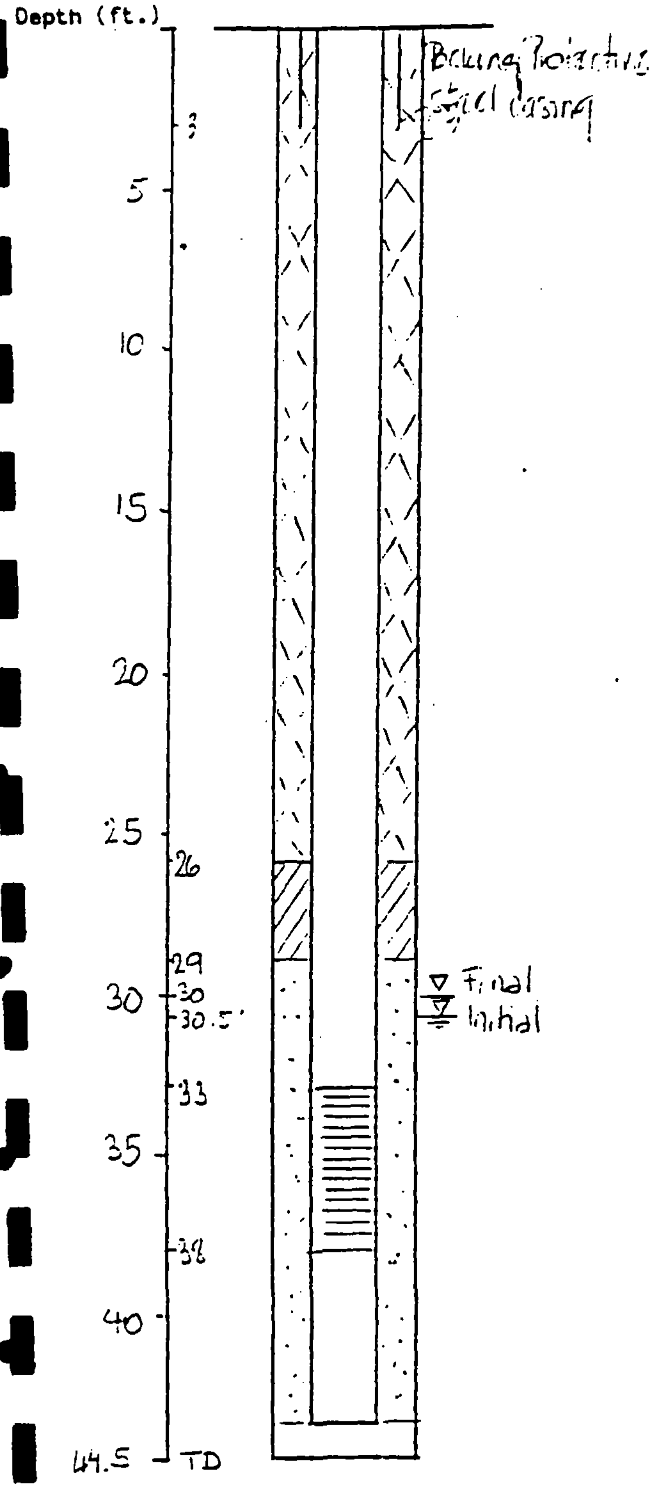
Project [illegible]  TDD No. [illegible]

Location [illegible]  Well Number [illegible] - 2

Geologist [illegible]  Date(s) of Installation [illegible]

Depth to Water 30.0 feet (G.L.)  Elevation from Measuring Point 6758.44

Depth (ft.)




DRILLING SUMMARY:

Driller Earth D. A. S. - Alton Schoomaker

Rig Type [illegible]

Drilling Method hollow stem auger

Bit(s) [illegible]

Drilling Fluid 3 gallons [illegible] water

Surface Casing

Hollow Stem/Drive Casing I.D. (in.) [illegible]

Total Depth of Boring (ft.) 44.5

Borehole Diameter (in.) [illegible]

WELL DESIGN:

Completion Above Grade GL  Below Grade

Basis: Geological Log ✓  Geophysical Log

Type

Total Depth of Well (ft.) 43.5

Casing String(s): C=casing S=screen

| | | | | | |
|---|---|---|---|---|---|
| C | 43.5 | 38 | S | 38 | 33 |
| | 33 | 0 | | | |

Casing: 2" Schedule 40 PVC  10' section (33-0) 5' section (43.5-38)

Screen: 2" schedule 40 PVC .020 slot, 5' section

Centralizers None

Gravel/Sand Pack 43.5 to 20 feet

10-20 mesh Colorado silica sand

Bentonite Seal(s) 29 to 26 feet

to feet

Bentonite (type) 1/4" pellets

Backfill (cuttings) to feet

Cement Seal(s) 26 to 0 feet

to feet

Cement Composition [illegible]

Protective Casing [illegible] to [illegible] feet

Protective Casing Type steel [illegible]

Other

WELL DEVELOPMENT:

Method Hand Pump

Duration [illegible] hrs Estimated production 0.5 gpm

Water Appearance [illegible]

Remarks:

## WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square

Location Park City, UT

Geologist K. Moll

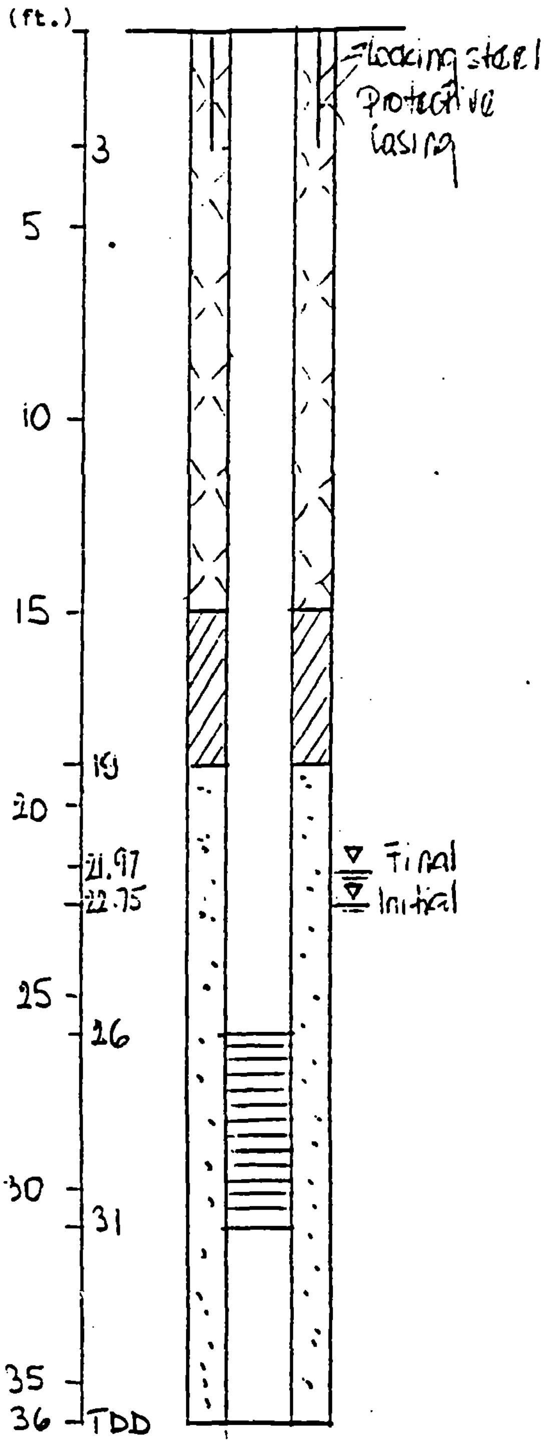
Depth to Water 21.97 feet (G.L.)

TDD No. FD8-3611-34D

Well Number PS-MW-3

Date(s) of Installation 7-28/29-87

Elevation from Measuring Point 6743.35




DRILLING SUMMARY:

Driller E.D.G.G. Alton Schoomaker

Rig Type CME 55

Drilling Method Hollow Stem Auger

Bit(s) Tooth bit

Drilling Fluid 2 gal City water

Surface Casing

Hollow Stem/Drive Casing I.D. (in.) 4 1/4

Total Depth of Boring (ft.) 36.0

Borehole Diameter (in.) 7 5/8

WELL DESIGN:

Completion Above Grade at ✓ Below Grade

Basis: Geological Log ✓ Geophysical Log

Type

Total Depth of Well (ft.) 36.0

Casing String(s): C=casing S=screen

C - 36 - 31 | S - 31 - 26

- 26 - 0

Casing: 2" Schedule 80, PVC 5x10' Sections

Screen: 2" Schedule 80 PVC, 5' Section 0.020 slot

Centralizers None

Gravel/Sand Pack 36 to 19 feet

10-20 Mesh Silica Sand

Bentonite Seal(s) 19 to 15 feet

to feet

Bentonite (type) 1/4" Pellets

Backfill (cuttings) to feet

Cement Seal(s) to feet

to feet

Cement Composition 4% Bentonite (Volclay)

96% Portland Type II + water

Protective Casing 3 to 0 feet

Protective Casing Type

6" Steel with locking top

Other

WELL DEVELOPMENT:

Method Hand Pump

Duration 1 hrs Estimated production 1.25 gpm

Water Appearance slightly muddy

Remarks:

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project: Prospector Square

TDD No.: F08-8611-34D

Location: Park City, UT

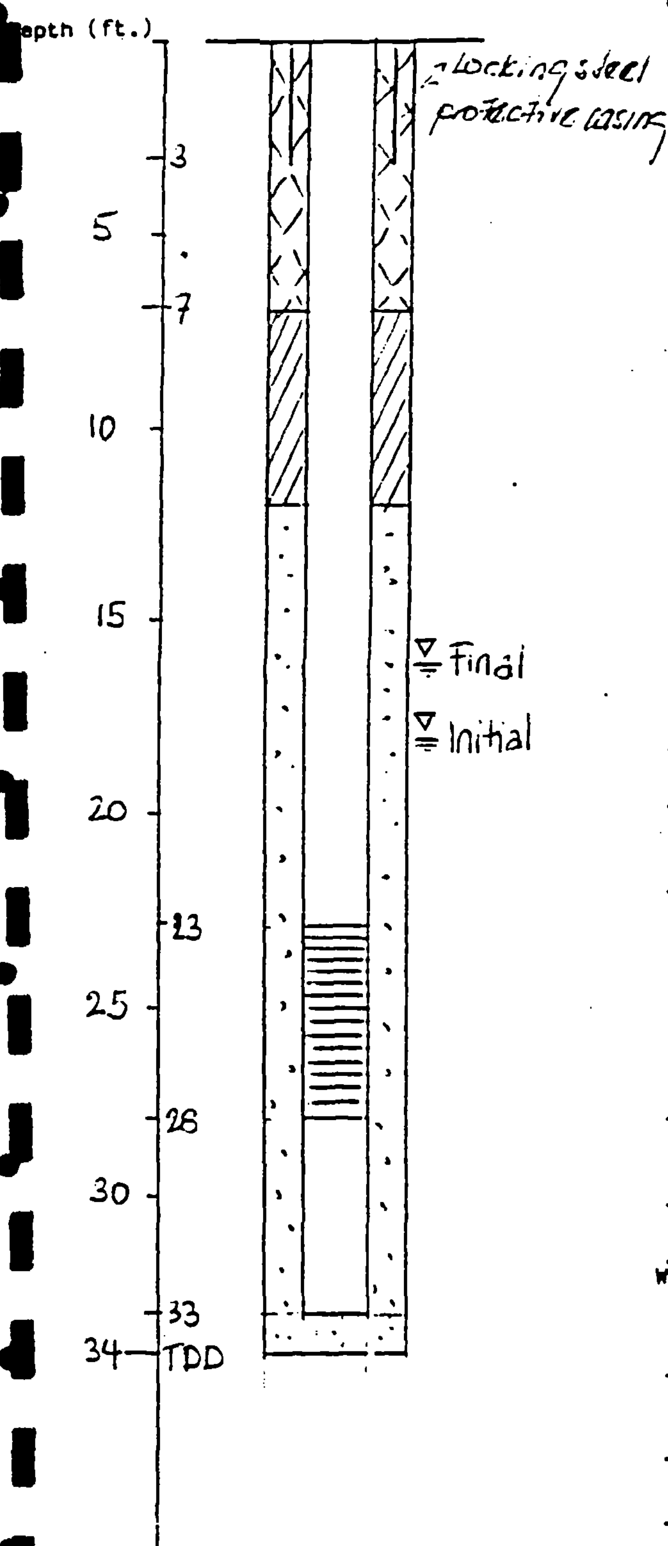
Well Number: PS-MW-5

Geologist: V. Moll

Date(s) of Installation: 7-20-87, 7-27-87

Depth to Water: 16.12 feet (G.L.)

Elevation from Measuring Point: 6741.04




DRILLING SUMMARY:

Driller: E.D.A.T. Alton Schoomaker

Rig Type: CME 75

Drilling Method: Hollow stem auger

Bit(s): Tooth type "

Drilling Fluid: "

Surface Casing:

Hollow Stem/Drive Casing I.D. (in.): 4 1/4"

Total Depth of Boring (ft.): 34.0

Borehole Diameter (in.): 7 5/8

WELL DESIGN:

Completion: Above Grade at; Below Grade

Basis: Geological Log ✓; Geophysical Log; Type

Total Depth of Well (ft.): 34.0

Casing String(s): C=casing S=screen

| C=casing | | S=screen | |
|---|---|---|---|
| C | -33 -28 | S | -28 -23 |
| C | -23 - 0 | | - |

Casing: 2" Schedule 80 PVC 5&10' Sections

Screen: 2" Schedule 80 PVC .020 slot 5' section

Centralizers: /

Gravel/Sand Pack: 33 to 20 feet
10-20 Mesh silica Sand

Bentonite Seal(s): 12 to 7 feet
to feet

Bentonite (type): 1/4" pellets

Backfill (cuttings): 20 to 7 feet

Cement Seal(s): 7 to 0 feet
to feet

Cement Composition: 4% bentonite (Wyo Clay) + Portland type II - slurry

Protective Casing: +2.30 to 0 feet

Protective Casing Type: 6" steel with locking cap

Other: /

WELL DEVELOPMENT:

Method: Hand pump

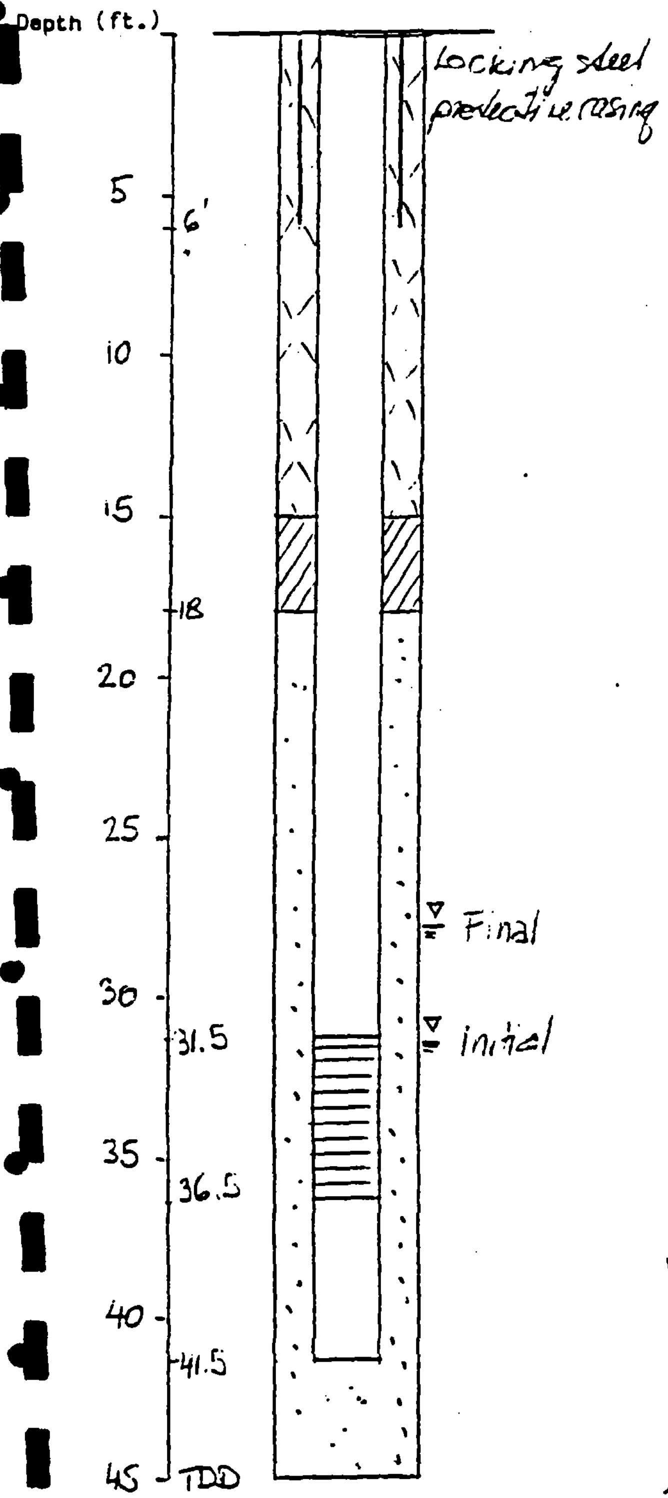
Duration: 0.7 hrs Estimated production: 2 gpm

Water Appearance:

Remarks: Well was completed in a perched water table.

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project: Prospector Square
TDD No.: F08-8611-34D
Location: Park City UT
Well Number: PS-MW-4
Geologist: K. Moll
Date(s) of Installation: 7-20/21-87
Depth to Water: 27.79 feet (G.L.)
Elevation from Measuring Point: 6773.49




DRILLING SUMMARY:

Driller: E.D.A.G. Alton Schoomaker
Rig Type: CME 75
Drilling Method: Hollow stem auger
Bit(s): Tooth type
Drilling Fluid: None

Surface Casing:
Hollow Stem/Drive Casing I.D. (in.): 4 1/4
Total Depth of Boring (ft.): 45.0
Borehole Diameter (in.): 7 5/8

WELL DESIGN:

Completion: Above Grade: at; Below Grade:
Basis: Geological Log ✓; Geophysical Log Type:
Total Depth of Well (ft.): 45
Casing String(s): C=casing S=screen

| | | | |
|---|---|---|---|
| C | 45-40 | S | 40-35 |
| | 35-0 | | |

Casing: 2" Schedule 80 PVC 5' & 10' Sections

Screen: 2" Schedule 80, PVC .020 slots

Centralizers: None
Gravel/Sand Pack: 45 to 18 feet
10-20 Mesh Silica Sand
Bentonite Seal(s): 18 to 15 feet
to feet
Bentonite (type): 1/4" Pellets
Backfill (cuttings): to feet
Cement Seal(s): 15 to 0 feet
to feet
Cement Composition: 4% bentonite + Portland I/II slurry
Protective Casing: 6' to 0.0' feet
Protective Casing Type: 6" steel with locking cap
Other:

WELL DEVELOPMENT:

Method: Hand pump + bailer
Duration: 0.55 hrs Estimated production: 1.5 gpm
Water Appearance:

Remarks: well was filled with fines after completion
1) Surge block was used with bailer to clean the well
2) During completion well was shifted up to 41.5'. Adjust drilling summary data to 2 ...

## WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square

TDD No. F98 - 864 - 34D

Location Park City, UT

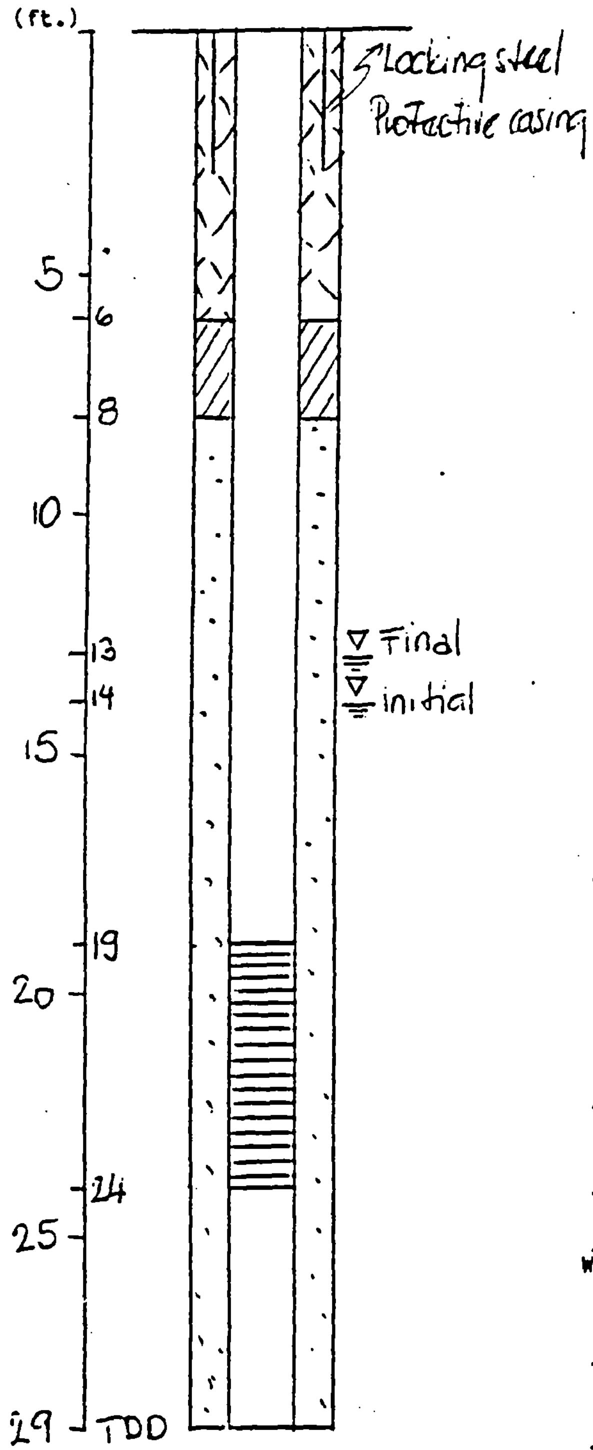
Well Number PS - MW - 6

Geologist C. Moll

Date(s) of Installation 7-20/21-87

Depth to Water 13.0 feet (G.L.)

Elevation from Measuring Point 6731.48




DRILLING SUMMARY:

Driller E.A.D.J. - Alton Schoomaker

Rig Type CME 75

Drilling Method Hollow Stem Auger

Bit(s) Tooth Bit

Drilling Fluid 0 gall distilled water

Surface Casing

Hollow Stem/Drive Casing I.D. (in.) 4 1/4

Total Depth of Boring (ft.) 29'

Borehole Diameter (in.) 7 1/2

WELL DESIGN:

Completion Above Grade at / Below Grade

Basis: Geological Log / Geophysical Log

Type

Total Depth of Well (ft.) 29.0

Casing String(s): C=casing S=screen

C - 29 - 24 | S - 24 - 19

- 19 - 0

Casing: 2" Schedule 80 PVC

Screen: 2" Schedule 80 PVC .010 slot

Centralizers none

Gravel/Sand Pack 29 to 8 feet

10-20 Mesh Silica Sand

Bentonite Seal(s) 8 to 6 feet

to feet

Bentonite (type) 1/4" Pellets

Backfill (cuttings) to feet

Cement Seal(s) 6 to 0 feet

to feet

Cement Composition Portland Type II cement

Protective Casing 3.0 to 0 feet

Protective Casing Type 6" steel with locking cap

Other

WELL DEVELOPMENT:

Method Hand Pump

Duration 0.7 hrs Estimated production 1 gpm

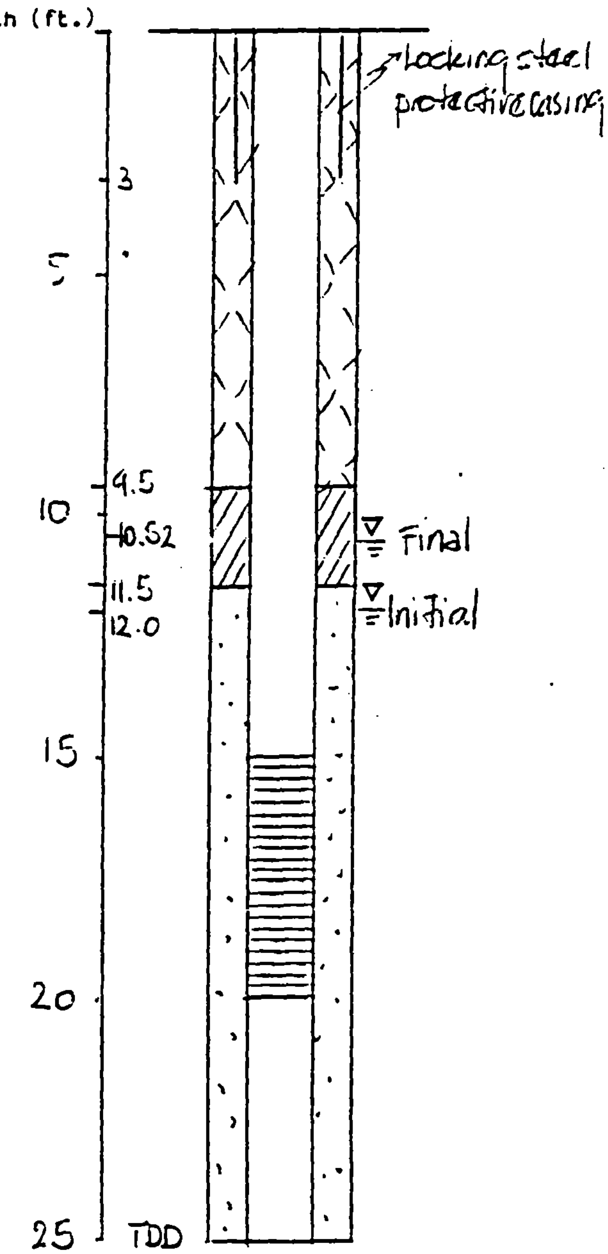
Water Appearance clear

Remarks: Some backfill cuttings are mixed with sand pack at 14-8' interval

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project: Prospector Square
Location: Park City UT
Geologist: K. Moll
Depth to Water: 10.52 feet (G.L.)

TDD No.: F08 - 8611 - 34D
Well Number: PS - MW - 7
Date(s) of Installation: 7-21-87
Elevation from Measuring Point: 6722.46




DRILLING SUMMARY:

Driller: E.D.A.G. Alton Schoomaker
Rig Type: CME 75
Drilling Method: Hollow stem auger
Bit(s): Tooth type
Drilling Fluid: none
Surface Casing: 6"
Hollow Stem/Drive Casing I.D. (in.): 7 1/4
Total Depth of Boring (ft.): 25
Borehole Diameter (in.): 7 1/2

WELL DESIGN:

Completion: Above Grade / at Grade / Below Grade
Basis: Geological Log ✓ Geophysical Log ______ Type ______
Total Depth of Well (ft.): 25
Casing String(s): C=casing S=screen

| | | | |
|---|---|---|---|
| C | 25-20 | S | 20-15 |
| C | 15-0 | | |

Casing: 2" Schedule 80 PVC 5 & 10' Sections
Screen: 2" Schedule 80 PVC, .020 slots 5' section
Centralizers: none
Gravel/Sand Pack: 25 to 11.5 feet
10-20 Mesh Silica Sand
Bentonite Seal(s): 11.5 to 9.5 feet
to feet
Bentonite (type): 1/4" Pellets
Backfill (cuttings) to feet
Cement Seal(s): 9.5 to grade (0) feet
to feet
Cement Composition: 4% Bentonite (Volclay) Wyoming, 96% Portland Cement Type II + water
Protective Casing to feet
Protective Casing Type: 6" steel with locking cap
Other

WELL DEVELOPMENT:

Method: Hand Pump
Duration: 0.75 hrs Estimated production 0.6 gpm
Water Appearance: muddy
Remarks:

## WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square

Location Park City, UT

Geologist Mike Pecora

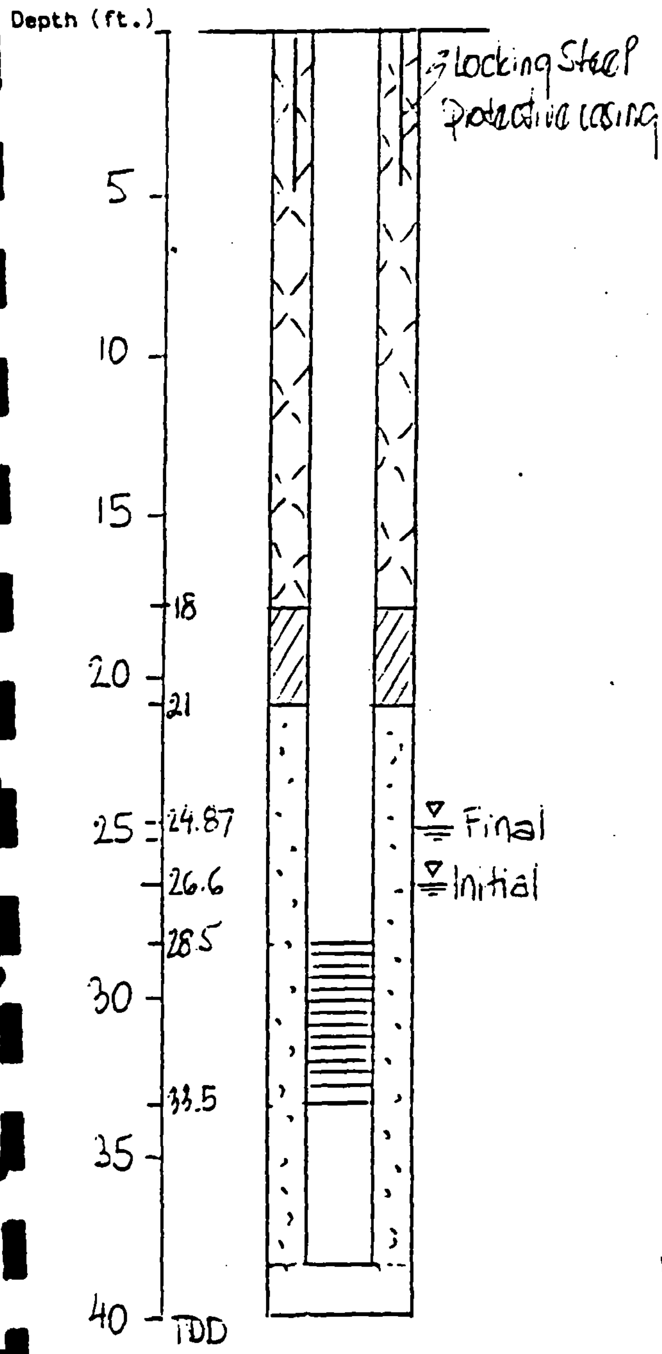
Depth to Water ______ feet (G.L.)

TDD No. F08-8611-34D

Well Number PS-MW-8

Date(s) of Installation 8/4/87

Elevation from Measuring Point 6751.41




DRILLING SUMMARY:

Driller E.D.A.G. Alton Schoomaker

Rig Type CME 75

Drilling Method Hollow stem auger

Bit(s) Tooth type

Drilling Fluid —

Surface Casing ______

Hollow Stem/Drive Casing I.D. (in.) 4 1/4

Total Depth of Boring (ft.) 40.0

Borehole Diameter (in.) 7 5/8

WELL DESIGN:

Completion Above ~~Above~~ at Grade ✓ Below Grade ______

Basis: Geological Log ✓ Geophysical Log ______ Type ______

Total Depth of Well (ft.) 38.5

Casing String(s): C=casing S=screen

C - 38.5 - 33.5 | S - 33.5 - 28.5

- 28.5 - 0

Casing: 2" Schedule 80 PVC, 5 x 10' Sections

Screen: 2" Schedule 80PVC 0.020 slots

Centralizers None

Gravel/Sand Pack 39 to 21 feet

10-20 Mesh Silica Sand

Bentonite Seal(s) 21 to 18 feet

to ______ feet

Bentonite (type) 1/4 Pellets

Backfill (cuttings) ______ to ______ feet

Cement Seal(s) 18 to 0 feet

______ to ______ feet

Cement Composition 5% Bentonite + Portland Type II slurry

Protective Casing 5 to 0 feet

Protective Casing Type 6" Steel with locking cap

Other ______

WELL DEVELOPMENT:

Method ______

Duration ______ hrs Estimated production ______ gpm

Water Appearance ______

Remarks: Original hole MW-8 was redrilled at the same location because wrong completion (unscrewed PVC casing by HSA)

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project [illegible]

TDD No. [illegible]

Location [illegible]

Well Number [illegible]

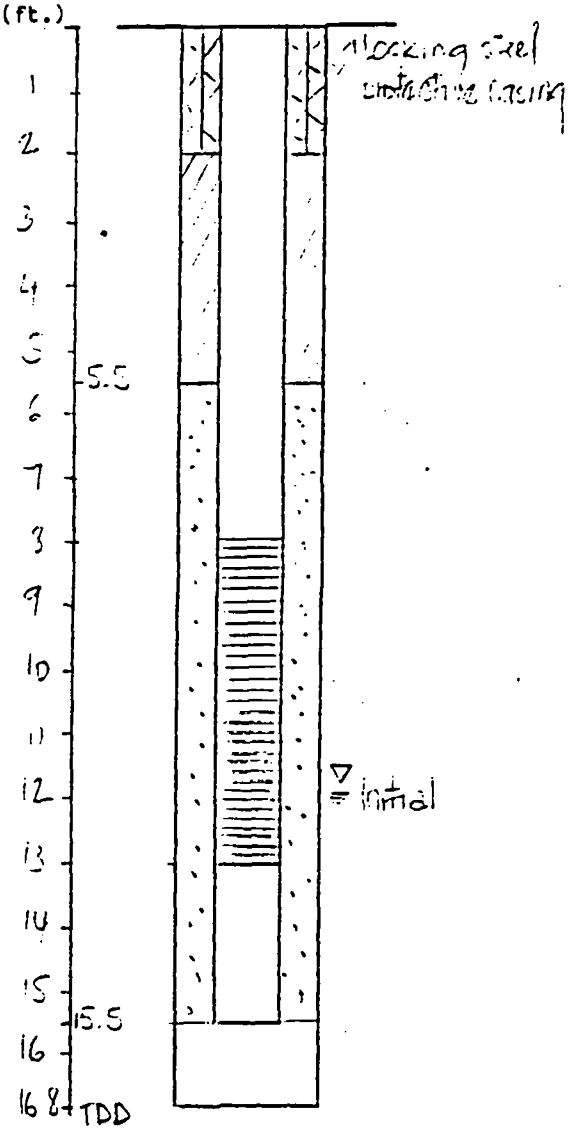
Geologist [illegible]

Date(s) of Installation [illegible]

Depth to Water 6.0 feet (G.L.)

Elevation from Measuring Point [illegible]

Depth (ft.)




DRILLING SUMMARY:

Driller [illegible]

Rig Type [illegible]

Drilling Method [illegible]

Bit(s) [illegible]

Drilling Fluid [illegible]

Surface Casing

Hollow Stem/Drive Casing I.D. (in.) [illegible]

Total Depth of Boring (ft.) [illegible]

Borehole Diameter (in.) [illegible]

WELL DESIGN:

Completion Basis: Above Grade ✓ Below Grade

Geological Log ✓ Geophysical Log

Type

Total Depth of Well (ft.) 15.5

Casing String(s): C=casing S=screen

C 15 - 13 | S 13 - 8

8 - 0

Casing: 2" Schedule 80 PVC, 10' sections

Screen: [illegible]

Centralizers none

Gravel/Sand Pack 15.5 to 5.5 feet

10-20 [illegible]

Bentonite Seal(s) 5.5 to [illegible] feet

to feet

Bentonite (type) [illegible]

Backfill (cuttings) to feet

Cement Seal(s) [illegible] to [illegible] feet

to feet

Cement Composition

[illegible]

Protective Casing [illegible] to [illegible] feet

Protective Casing Type

[illegible]

Other

WELL DEVELOPMENT:

Method [illegible] Pump & Bailer

Duration [illegible] hrs Estimated production [illegible] gpm

Water Appearance [illegible] muddy

Remarks:

[illegible]

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square

Location Park City UT

Geologist M. Pacomi

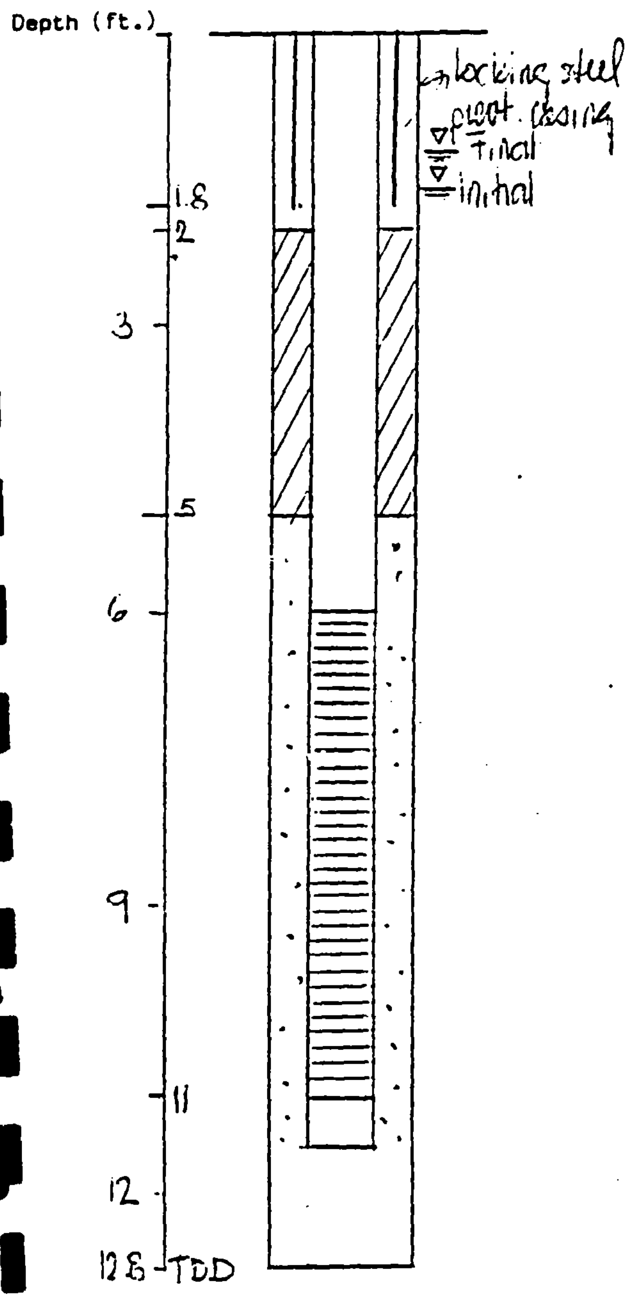
Depth to Water 1.24 feet (G.L.)

TDD No. F08 - 8611 - 34D

Well Number PS - MW - 10

Date(s) of Installation 7-31-87

Elevation from Measuring Point




DRILLING SUMMARY:

Driller E.D.G.G. Alton Schoomaker

Rig Type CME 75

Drilling Method Hollow Stem Auger

Bit(s) Tooth type

Drilling Fluid Nil

Surface Casing

Hollow Stem/Drive Casing I.D. (in.) 4 1/4

Total Depth of Boring (ft.) 12.8'

Borehole Diameter (in.) 7 1/4

WELL DESIGN:

Completion Above Grade at Grade Below Grade

Basis: Geological Log ✓ Geophysical Log

Type

Total Depth of Well (ft.) 11.5

Casing String(s): C=casing S=screen

C - 11.5 - 11.0 | S - 11.0 - 6.0

- 6.0 - 0 | -

Casing: 2" Schedule 80, PVC

Screen: 2" Schedule 80 PVC 0.020 slot

Centralizers None

Gravel/Sand Pack 11.5 to 5.0 feet

10-20 Mesh Silica Sand

Bentonite Seal(s) 5.0 to 2.0 feet

to feet

Bentonite (type) 1/4 pellets

Backfill (cuttings) to feet

Cement Seal(s) 2.0 to 0 feet

to feet

Cement Composition Premixed Mix + Portland type II cement + water

Protective Casing 18" to 0 feet

Protective Casing Type 6" Steel with locking cap

Other

WELL DEVELOPMENT:

Method

Duration 1 hrs Estimated production 0.8 gpm

Water Appearance muddy

Remarks:

**WELL/PIEZOMETER COMPLETION DIAGRAM**

Project Prospector Square

TDD No. F08-8811-34D

Location Park City UT

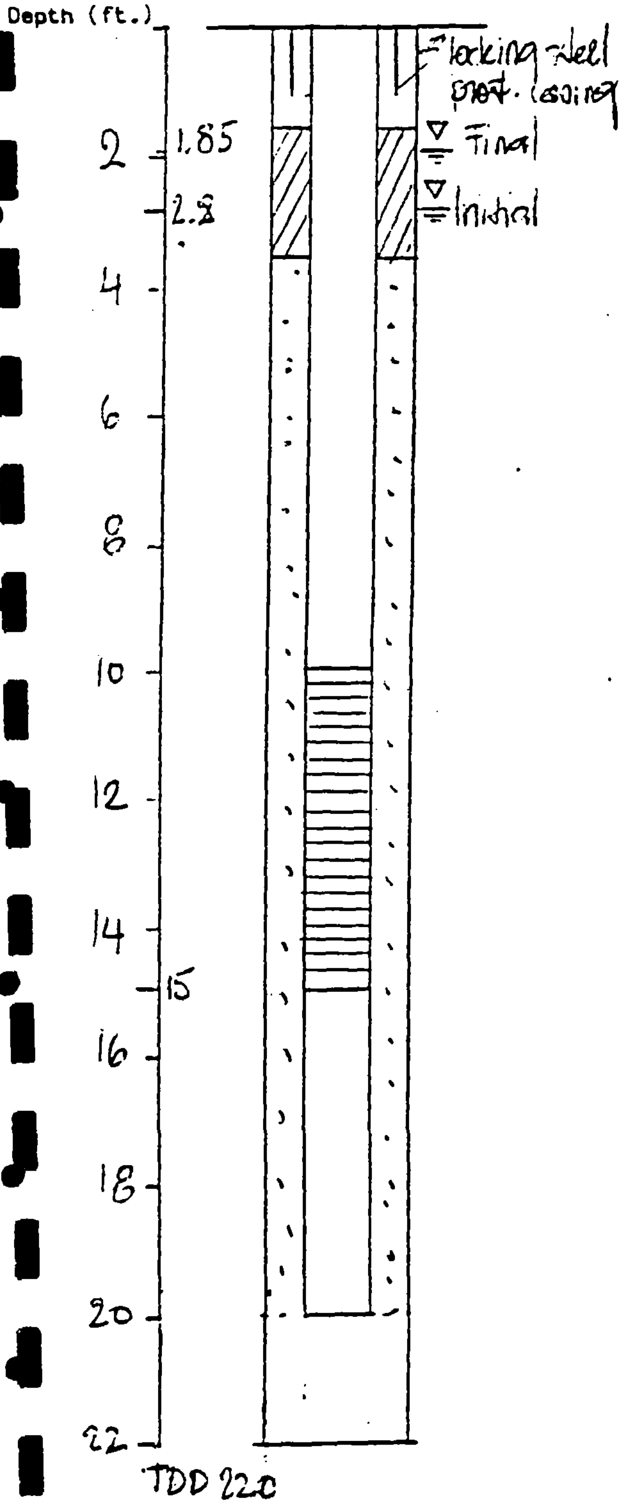
Well Number PS-MW-11

Geologist M. Perona

Date(s) of Installation 8-13-87

Depth to Water 1.85 feet (G.L.)

Elevation from Measuring Point




DRILLING SUMMARY:

Driller E.D.A.G. Alton Schoomaker

Rig Type CME 75

Drilling Method HSA

Bit(s) Tooth

Drilling Fluid water

Surface Casing

Hollow Stem/Drive Casing I.D. (in.) 4 1/4

Total Depth of Boring (ft.) 22.0

Borehole Diameter (in.) 7 3/4

WELL DESIGN:

Completion Above Grade at ✓ Below Grade

Basis: Geological Log ✓ Geophysical Log Type

Total Depth of Well (ft.) 20.0

Casing String(s): C=casing S=screen

| | | | |
|---|---|---|---|
| C | 20-15 | S | 15-10 |
| | 10-0 | | |

Casing: 2" Schedule 80 PVC

Screen: 2" Schedule 80 PVC 0.020 slot

Centralizers none

Gravel/Sand Pack 20 to 2.5 feet
10-20 Mesh Silica Sand

Bentonite Seal(s) 2.5 to 1.5 feet

to feet

Bentonite (type) 1/4" Pellets

Backfill (cuttings) to feet

Cement Seal(s) 1.5 to 0 feet

to feet

Cement Composition Portland type II cement

Protective Casing 1.0 to 0 feet

Protective Casing Type 6" Steel with locking cap

Other

WELL DEVELOPMENT:

Method Hand pump

Duration 30 min hrs Estimated production 1.2 gpm

Water Appearance slightly muddy

Remarks:

ecology and environment, inc.

1776 SOUTH JACKSON STREET, DENVER, COLORADO 80210, TEL. 303-757-4984

International Specialists in the Environment

TO : Paula Schmittdiel, EPA Utah State Coordinator
FROM : Mike Carmien, E & E FIT
DATE : March 15, 1988
SUBJECT: Draft Report, Field Activities, Well Drilling, Prospector Square, Park City, Utah, TDD F08-8611-34J.

The purpose of this report is to briefly summarize the drilling activities at Prospector Square, Park City, Utah in fulfillment of TDD F08-8611-34J. Five new monitoring wells were installed throughout Prospector Square by E & E FIT, with project officer Ken Moll. These wells are to be used by the USGS for aquifer tests and ground water sampling. Scheduled events are: well installation, January - February, 1988; aquifer pump testing, February, 1988; and ground water sampling, March, 1988.

The objectives of the five monitoring wells were to provide data needed to determine if pumping of the Park Meadows Well affects water levels in the unconsolidated valley fill overlying the Thaynes Formation in areas adjacent to the Silver Creek Tailings Site. These wells were also used to determine if the valley fill at the Silver Creek Tailings site contains any layers of low permeable strata that would retard ground water flow towards the Thaynes aquifer.

The contractor used for the drilling and installation of these wells was Dave's Drilling out of Salt Lake City, Utah. Two different rig types were used, the first being a Chicago Pneumatic 7000 air rotary drill with hammer and casing; the second, a Portadrill Model TLT hollow stem auger rig. Several contract disputes arose over performance and sampling costs, with a final agreement of delay time payment minus the first half hour for each sample taken. With contract disputes settled, well installation work continued on without incident.

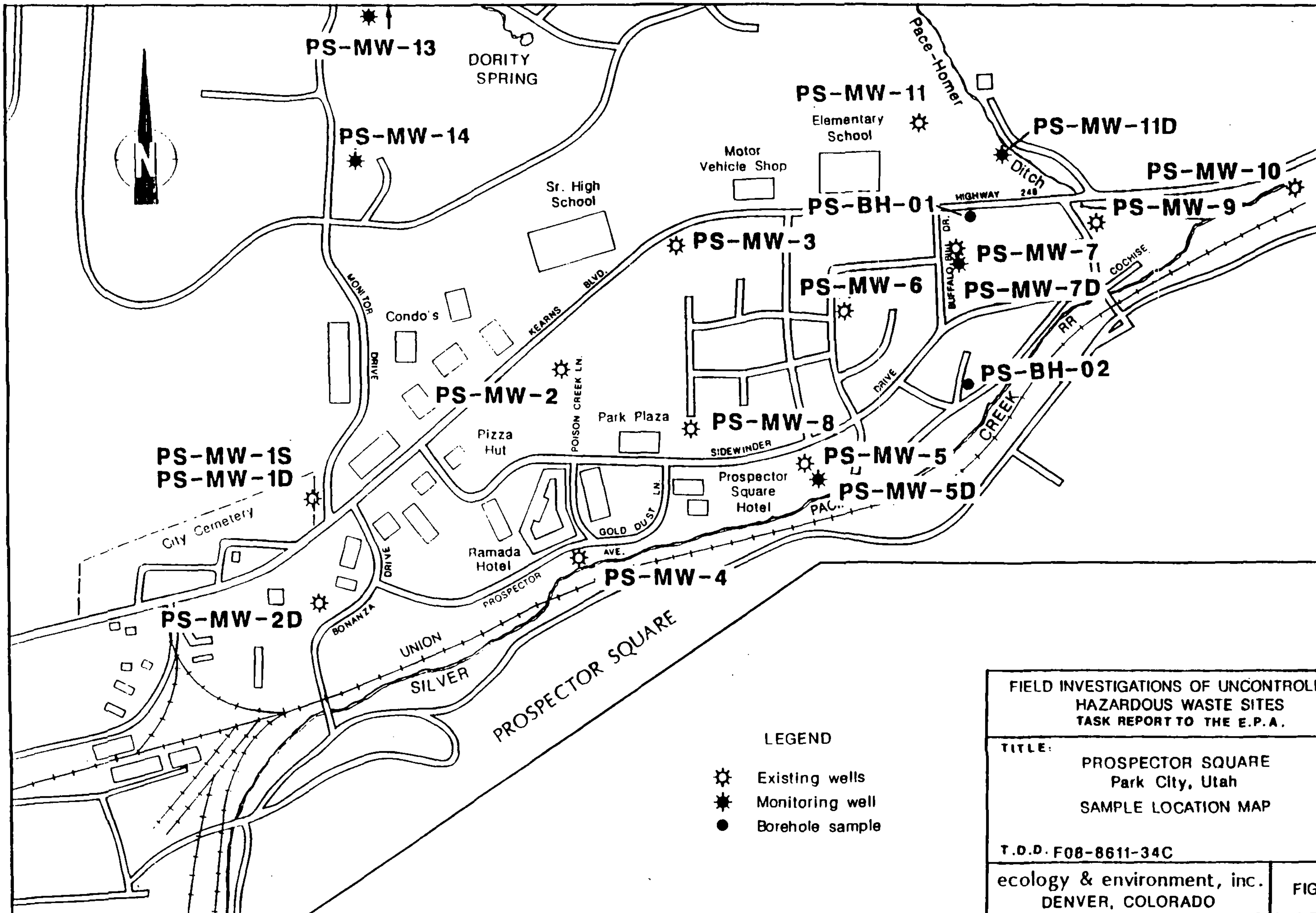
Five new monitoring wells were installed into the unconsolidated valley fill at and around Prospector Square, Park City, Utah. These wells were numbered PS-MW-13, PS-MW-14, PS-MW-11D, PS-MW-7D and PS-MW-5D. Figure 1 of this draft report illustrates the locations of these wells. Ecology and Environment, Inc. personnel worked closely with the USGS personnel in meeting the specifications of well lithology logging, bedrock confirmation, well installations and well development as specified in the contract. All wells were drilled to bedrock (Thaynes or Woodside Formations) and then the wells were set above the bedrock - valley fill interface in the alluvium. All wells were then installed and developed according to contract specifications. Table 1 of this report lists the dates of drilling activities per well. This table also provides information on borehole depth, rig type, static water levels, depth of intake, etc.

Lithologic logging for all five wells was performed using 18 inch split spoon samplers. Samples were generally taken every 10 feet with the hollow stem auger rig, except when changes in lithology dictated a change in sampling depth. The Chicago Pneumatic Rig operated with 20 foot steel casings, which made sampling every 10 feet cumbersome and eventually a center of the contract disputes mentioned earlier. All samples were recorded in Field Log Books and pictures were taken by the USGS. For a more complete description of the individual well lithology, please see the attached lithologic logs.

Information regarding the lithology for well PS-MW-5D has been estimated for this report due to the unavailability of the field note book at the time this was written. A more complete lithology for PS-MW-5D will be updated into the Prospector Square's file when this information becomes avaiable.

TABLE 1
WELL CHRONOLOGY AND SPECIFICATIONS
PROSPECTOR SQUARE, PARK CITY, UTAH
TDD F08-8611-34J

| WELL NO. | DATES OF DRILLING | DATES OF INSTALLATION 1988 | BORE HOLE DEPTH | STATIC WATER LEVEL | DEPTH OF SCREEN | LOGGING METHOD | RIG TYPE |
|---|---|---|---|---|---|---|---|
| PS-MW-13 | 1/21-1/23 | 1/23-1/24 | 61 ft | 8.7 ft | 51-41 ft | Split Spoon | Casing Hammer |
| PS-MW-14 | 1/24-1/26 | 1/26-1/27 | 75 ft | 27 ft | 58.5-48.5 ft | Split Spoon | Casing Hammer |
| PS-MW-11D | 2/4-2/6 | 2/6-2/7 | 85 ft | 15 ft | 79.8-69.8 ft | Split Spoon | Hollow Stem Auger |
| PS-MW-7D | 2/9-2/13 | 2/13-2/14 | 138 ft | 12 ft | 130-120 ft | Split Spoon | Hollow Stem Auger |
| PS-MW-5D | 2/88-2/21 | 2/21-2/22 | 95 ft | 20 ft | 93-83 ft | Split Spoon | Hollow Stem Auger |




| FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES<br>TASK REPORT TO THE E.P.A. | |
|---|---|
| TITLE: PROSPECTOR SQUARE<br>Park City, Utah<br>SAMPLE LOCATION MAP | |
| T.D.D. F08-8611-34C | |
| ecology & environment, inc.<br>DENVER, COLORADO | FIG. 2 |
| Date: 10/87 Drawn by: RSM Scale: 1" = 665' | |

## WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square

TDD No. F08-8611-34

Location Park City, Utah

Well Number PS - MW - 7D

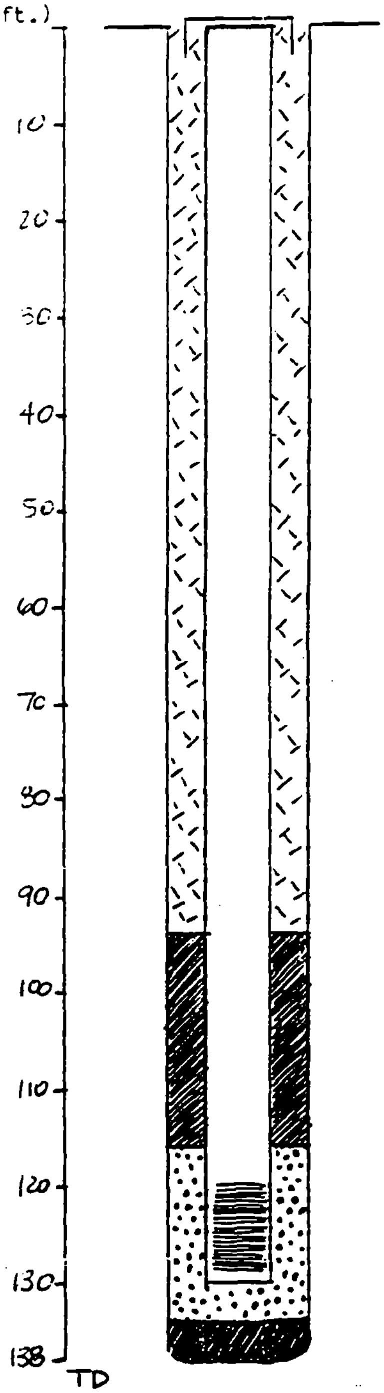
Geologist Diane Coker

Date(s) of Installation 2/14/88

Depth to Water 20' initially; 11' post construction; pre-development

Elevation from Measuring Point

Depth (ft.)




DRILLING SUMMARY:

Driller Dave's Drilling
Salt Lake City, Utah

Rig Type Portadrill CP 700C

Drilling Method hollow stem auger

Bit(s) tooth (6)

Drilling Fluid none used

Surface Casing 6" steel with locking steel cap

Hollow Stem/Drive Casing I.D. (in.) 4¼"

Total Depth of Boring (ft.) 138

Borehole Diameter (in.) 7¼

WELL DESIGN:

Completion Above Grade 6" Below Grade

Basis: Geological Log ✓ Geophysical Log

Type split spoon and cutting sample

Total Depth of Well (ft.) 130

Casing String(s): C=casing S=screen

| | | | |
|---|---|---|---|
| 130' | - | 120' | S |
| 120' | - | +.50' | C |

Casing: PVC, 2", sched 80, flush joint

Screen: PVC, 2" 20-slot

Centralizers none used

Gravel/Sand Pack 134 to 116 feet
10-20 mesh Colorado silica sand

Bentonite Seal(s) 116 to 94 feet
138 to 134 feet

Bentonite (type) 138-134 Volclay ½" pellets; 116-94 4% Quik Gel slurry

Backfill (cuttings) — to — feet

Cement Seal(s) 94 to 0 feet
to feet

Cement Composition Portland Type II cement grout w/ 5% Quik Gel and 7 gal $H_2O$ per sack (94 lb) cement

Protective Casing 3.5' to +.5 feet

Protective Casing Type 6" steel w/locking steel cap

Other PVC slip cap on top of PVC casing; PVC screw cap on bottom of completion string

WELL DEVELOPMENT:

Method Air lift

Duration 4½ hrs Estimated production 1½ gpm

Water Appearance

Remarks:

12/04/88

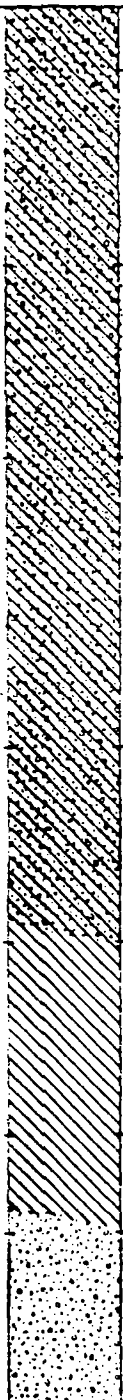
# LITHOLOGIC LOG
# PROSPECTOR SQUARE



WELL BORING NO. PS-MW-7D
ELEVATION (MSL) ____
BORING COMPLETION DATE 02/11/88
LOCATION Buffalo Bill/Doc Holliday
NE/NW/NW SEC 10, T 2S, R4 E
DRILLING METHOD Hollow stem auger
DRILLING CONTRACTOR Dave's Drilling
RIG TYPE Portadrill
LOGGER RH/DC
WATER LEVEL 1st ENCOUNTERED (ft.BGS) 15.00
STATIC WATER LEVEL (ft.BGS) 12.00
(BGS = Below Ground Surface)

| Depth in ft | Lithol. Column | Sample Type ID | LITHOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|
| | | | For description of samples from 0-25', refer to Lithologic Log for Well PS-MW-7, located 5' north of PS-MW-7D | No split spoon samples obtained 0-29' |
| 10 | | | | |
| 20 | | | | |
| 30 | | CORE | SAND, v f to f, v w srtd, ang to sbang, qtz, mica, biot, ls & rk chps; and GRAVEL, c, p srtd, w/10% sdy cly mtx | Spl spn 30-31.5': blw ct 15/43 (6"); 80% rcvy |
| | | CORE | CLAY, r brn to gy, sft to hd, w/blk str of carb mat; and SAND, m to c, w srtd, sbang to rd, fldsp, qtz, rk chps | Spl spn 35-36.5'; blw ct 72 ttl; 100% rcvy |
| 40 | | CORE | SAND, f to m, w srtd, sbang to ang, ss, ls, & sh chps, incr gr sz w/depth; and GRAVEL, sdy, cly (5-10%), p srtd, ang, ss, ls, sh chps | Spl spn 40-41.5'; 100% rcvy |
| | | CORE | CLAY, brn, w/sd, gvl, & cbl | Spl spn 45-46.5'; blw ct 72/83/71 (6"); 90% rcvy |
| 50 | | | | |
| | | CORE | CLAY/SAND/GRAVEL, cbls; p srtd, ang to sbang, cly abt 10% | Spl spn 55-56.5'; 100% rcvy |
| 60 | | | | |
| | | CORE | CLAY/SAND/GRAVEL, cbls, p srtd, w/r qtzt clasts | Spl spn 65-66.5'; 100% rcvy |

Well: 75-MW-7D Buffalo Bill/Doc Holliday



| Depth | Sample | Description | Remarks |
|---|---|---|---|
| 70 | | | |
| | CORE | CLAY/SAND/GRAVEL. cbls. p srtd. w/r slty sd. ss. & rk chps: cly abt 10% | Spl spn 75-76.5': 100% rcvy; int 75-75.4' prob "fill" |
| 80 | | | |
| | CORE | CLAY/SAND/GRAVEL. cbls. r brn to y brn. cly also dk gn/brn & gy: p srtd. sbang to sbrd: ss. qtzt. & rk chps | Spl spn 85-86.5': 100% rcvy |
| 90 | | | |
| | CORE | CLAY/SAND/GRAVEL. intbd & mxd: r brn: cly sdy & hd: sd m to c. p srtd. sbang to sbrd: gvl sdy. cly. p srtd | Spl spn 95-96.5': 100% rcvy |
| 100 | CORE | CLAY. gy w/r & y stn. hd. w/imbd sbrd qtzt. ss. & rk chps. some w/wthrd gn rind: also in cly. brn & blk carb mat. incl roots | Spl spn 100-101.5': blw ct 35/35/32 (6"): 100% rcvy |
| 110 | CORE | CLAY/SAND/GRAVEL. cbls. r brn; cly sft; sd m to c; sd, gvl & cbls p srtd. sbang to sbrd; clasts fldsp, qtz, qtzt, rk chps | Spl spn 110-111.5'; blw ct 71/220/___ (6"); 100% rcvy |
| 120 | CORE | CLAY. bn w/r. y, & ok: m stiff: sdy, slty | Spl spn 120-121.5'; blw ct 12/10/25 (6"); 100% rcvy |
| 130 | | | |
| | CORE | GRAVEL, fn pbl. w srtd, sbang to sbrd. fldspr, qtz; a few rk chps | Spl spn 135-136.5'; 100% rcvy |
| | GRAB | TD - 138' | Refusal 138' |

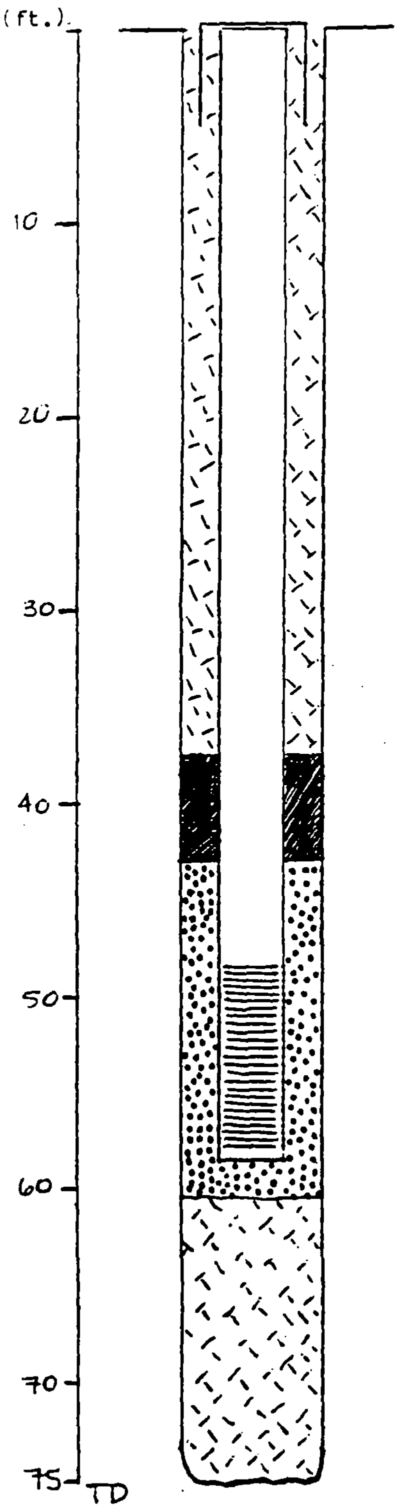
## WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square | TOD No. FC8-8611-34

Location Park City, Utah | Well Number PS-MW-14

Geologist Mike Carmien/Ken Moll | Date(s) of Installation 1/27/88

Depth to Water 27.7 feet (G.L.) | Elevation from Measuring Point




DRILLING SUMMARY:

Driller Dave's Drilling Salt Lake City, Utah

Rig Type Air rotary drill Chicago Pneumatic 7000

Drilling Method Air rotary casing drill + hammer

Bit(s) Tri cone 7 7/8" diamond stud

Drilling Fluid none used

Surface Casing 6" steel with locking cap

Hollow Stem/Drive Casing I.D. (in.) 7 7/8

Total Depth of Boring (ft.) 75

Borehole Diameter (in.) 7 7/8

WELL DESIGN:

Completion Grade At grade Below Grade

Basis: Geological Log ✓ Geophysical Log

Type split spoon + cuttings samples

Total Depth of Well (ft.) 58.5

Casing String(s): C=casing S=screen

| | | | | | |
|---|---|---|---|---|---|
| 58.5 | - 48.5 | S | | - | |
| 48.5 | - 0 | C | | - | |

Casing: 2" PVC flush joint Sched 80

Screen: 2" PVC 20-slot (10-ft section)

Centralizers none used

Gravel/Sand Pack 60.5 to 43 feet

Colorado Silica 10-20 mesh sand

Bentonite Seal(s) 43 to 37.5 feet

to feet

Bentonite (type) Baroid Quik-Gel

Backfill (cuttings) — to — feet

Cement Seal(s) 37.5 to 0 feet

75 to 60.5 feet

Cement Composition Portland Type II with 10% Quik-Gel and 7 gal $H_2O$/94 lb cement

Protective Casing +5 to 0 feet

Protective Casing Type 6" steel with lock and cap

Other PVC slip cap on top of completion string; PVC screw cap at base of completion string

WELL DEVELOPMENT:

Method Air lift

Duration 3 hrs Estimated production gpm

Water Appearance clear 9°C

Remarks: Top bentonite seal was a combination of 1.5 ft bentonite pellets and 4 ft Quik Gel slurry. OK'd by Dennis Elrod.

03/04/88

# LITHOLOGIC LOG
# PROSPECTOR SQUARE



WELL BORING NO. PS-MW-14

LOCATION PARK CITY, CARTIER PROPERTY
SW/SW/SE SEC 4, T 2 S, R 4 E

ELEVATION (MSL) ____

BORING COMPLETION DATE 01/24/88

DRILLING METHOD AIR ROTARY

DRILLING CONTRACTOR DAVE'S DRILLING

RIG TYPE CP 7000

LOGGER MC/KM

WATER LEVEL 1st ENCOUNTERED (ft.BGS) 35.00

STATIC WATER LEVEL (ft.BGS) 37.70

(BGS = Below Ground Surface)

| Depth in ft | Lithol. Column | Sample Type ID | LITHOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|
| | | GRAB | LOAM, dk brn | |
| | | GRAB | GRAVEL, w/silt & sdy loam | |
| | | GRAB | GRAVEL | |
| 10 | | | | |
| | | GRAB | GRAVEL, bldr & cbl; containing Calc, biot, qtz, FeS2, K-spar & sltst | |
| 20 | | | | |
| | | GRAB | CLAY, 20-30%, w/gvl | |
| | | GRAB | CLAY & GRAVEL, lt brn, sbang clasts | |
| 30 | | | | |
| | | CORE | No sample | Spl spn 37-38.5'; 0% rcvy |
| 40 | | GRAB | GRAVEL, p srtd, qtz, sltst, K-spar, Woodside sh chps | |
| 50 | | | | |
| | | GRAB | CLAY, m brn, w/c sd | |
| 60 | | CORE | GRAVEL, c, w/cly; & SAND, cly, Calc cmt; ls rk chps | Spl spn 60-61.5' |

Well: PS-MW-14 PARK CITY, CARTIER PROPERTY

| | | | | |
|---|---|---|---|---|
| 70 | | GRAB | SHALE, gyps, & LIMESTONE | Woodside sh; Thanes ls |
| | | GRAB | TD - 75' | |

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square

TDO No. 508-4611-34

Location Park City, Utah

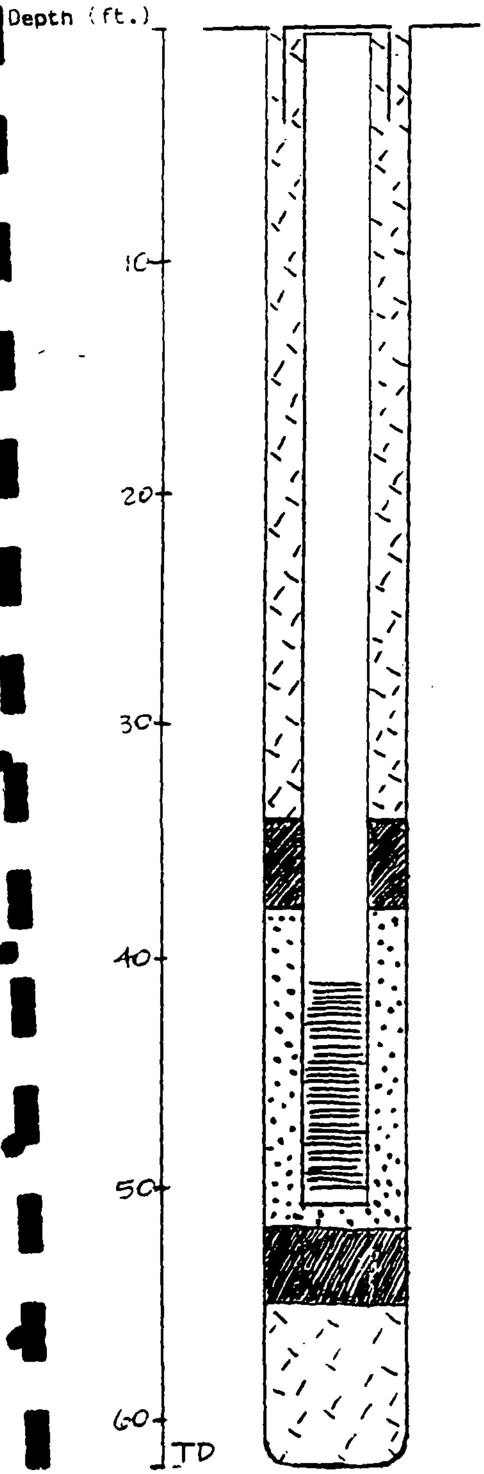
Well Number PS-MW-13

Geologist Mike Carmien/Ken Moll

Date(s) of Installation 1/24/88

Depth to Water 9.7 feet (G.L.)

Elevation from Measuring Point




DRILLING SUMMARY:

Driller Dave's Drilling
Salt Lake City, Utah

Rig Type Chicago Pneumatic 7000, air rotary w/casing hammer

Drilling Method Air rotary casing drill and hammer

Bit(s) tri-cone 7 7/8 diamond stud

Drilling Fluid city water

Surface Casing 4" steel with locking steel cap

Hollow Stem/Drive Casing I.D. (in.) 7 7/8

Total Depth of Boring (ft.) 61

Borehole Diameter (in.) 7 7/8

WELL DESIGN:

Completion Above Grade ______ Below Grade ✓

Basis: Geological Log ✓ Geophysical Log ______

Type split spoon samples and cuttings sample

Total Depth of Well (ft.) 51

Casing String(s): C=casing S=screen

51 - 41 S

41 - 0 C

Casing: PVC 2", Sched 80, flush joint

Screen: PVC, 20-slot screen

Centralizers none used

Gravel/Sand Pack 52 to 38 feet
Colorado Silica Sand 10-20 mesh

Bentonite Seal(s) 38 to 34 feet
55 to 52 feet

Bentonite (type) Quik Gel + pellets

Backfill (cuttings) — to — feet

Cement Seal(s) 62 to 55 feet
34 to 0 feet

Cement Composition Portland Type II w/10% Quik Gel and 7 gal $H_2O$ per 94 lb sack

Protective Casing 4.5 to 0 feet

Protective Casing Type 4" steel w/steel locking cap

Other PVC slip cap on top of completion string, PVC screw cap on bottom

WELL DEVELOPMENT:

Method Air lift

Duration 3 hrs Estimated production 0.65 gpm

Water Appearance clear, 9°C

Remarks: Conductivity 7150 umhos @ 25°C @ 1150
4440 umhos @ " " 1325
3500 umhos @ " " 1444

03/04/88

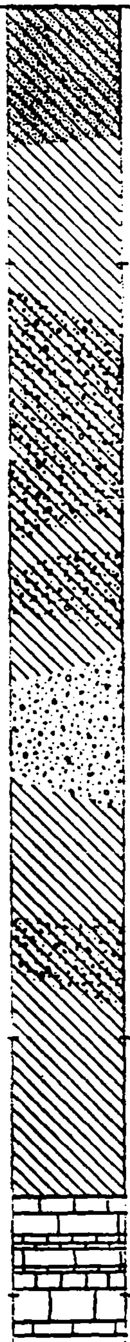
# LITHOLOGIC LOG
# PROSPECTOR SQUARE



WELL BORING NO. PS-MW-13 | ELEVATION (MSL) ____ | BORING COMPLETION DATE 01/21/88
LOCATION PARK CITY, RACQUET CLUB
SW/NW/SE SEC 4, T 2S, R 4 E
DRILLING METHOD AIR ROTARY

DRILLING CONTRACTOR DAVE'S DRILLING
RIG TYPE CP 7000
LOGGER MC/KM

WATER LEVEL 1st ENCOUNTERED (ft.BGS) 10.00
STATIC WATER LEVEL (ft.BGS) 3.70
(BGS = Below Ground Surface)

| Depth in ft | Lithol. Column | Sample Type ID | LITHOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|
| |  | GRAB | CLAY & SILT, m brn, w/1/8" pbl gvl | |
| | | GRAB | CLAY, m brn, moist | |
| 10 | | | | |
| | | GRAB | CLAY & GRAVEL, w/cbls 2-3", sbang | |
| | | | | Spl spn 20-21.5'; CL |
| 20 | | CORE | CLAY, lt brn, slty, l to m plas; & SAND, f to v f; lmn, hem, & Mn stn; no org | |
| | | GRAB | CLAY, w/s cbls, 1-2", p srtd, sbang to sbrd | |
| 30 | | GRAB | CLAY/SAND/GRAVEL, brn, p srtd | |
| | | GRAB | GRAVEL, c to v c pbl gvl, sbang, w/cly & sd | Gvl 60%, sd 30%, cly 10% |
| 40 | | CORE | CLAY, m brn, tt, w/v f sd & intbd sbang gvl; lmn & hem stn (2X) | Spl spn, 40-41.5'; 100% rcvy; CL |
| | | GRAB | | 41.5-54, cly, sd, gvl; gvl cnt may be incr w/depth |
| 50 | | | | |
| | | GRAB | | Sd/gvl @ 54' |
| | | GRAB | LIMESTONE, lt gy to wh, mas, w cpctd; some sh (Tr) chps | |
| 60 | | | | |
| | | GRAB | TD - 61' | Refusal 61' |

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project Prospector Square

TDD No. FC8 - 8611 - 34

Location Park City, Utah

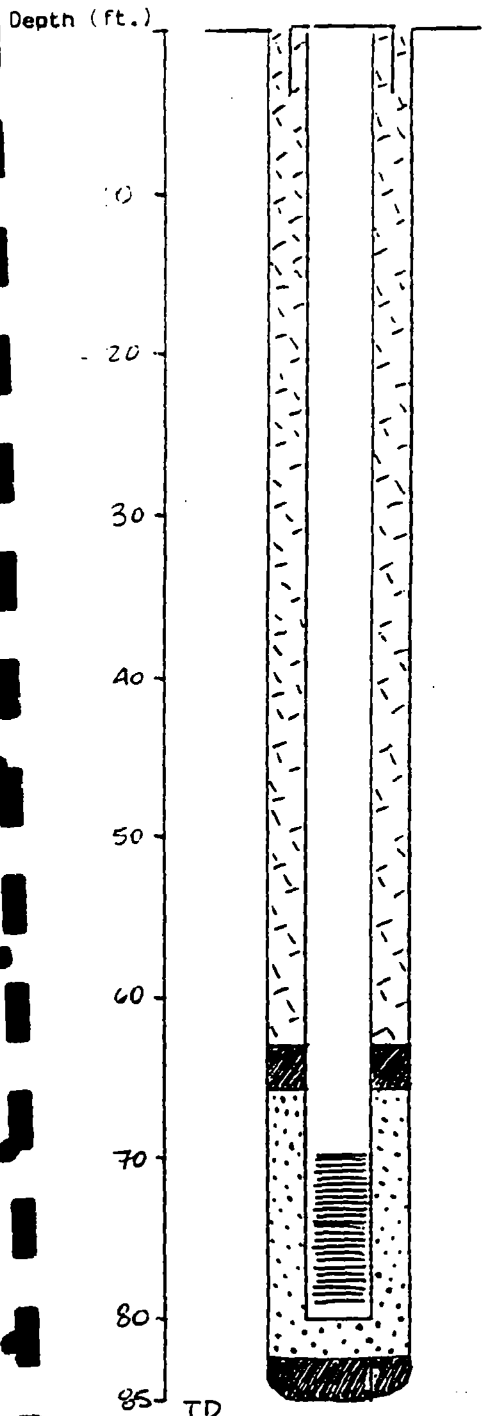
Well Number PS - MW - 11D

Geologist Ken Moll / Diane Coker

Date(s) of Installation 2/7/88

Depth to Water ________ feet (G.L.)

Elevation from Measuring Point ________




DRILLING SUMMARY:

Driller Dave's Drilling
Salt Lake City, Utah

Rig Type Portadrill CP7000

Drilling Method hollow stem auger

Bit(s) tooth (6)

Drilling Fluid none used

Surface Casing 6" steel

Hollow Stem/Drive Casing I.D. (in.) 4 1/4

Total Depth of Boring (ft.) 85

Borehole Diameter (in.) 7 1/4

WELL DESIGN:

Completion ~~Above~~ Grade At ~~Below Grade~~

Basis: Geological Log ✓ Geophysical Log ________

Type splitspoon and cuttings samples

Total Depth of Well (ft.) 79.8

Casing String(s): C=casing S=screen

79.8 - 69.8 S

69.8 - 0 C

Casing: PVC 2", Sched 80, Flush joint

Screen: PVC 20-slot

Centralizers none used

Gravel/Sand Pack 79.8 to 66 feet
Colorado Silica Sand 10-20 mesh

Bentonite Seal(s) 84 to 81.6 feet
66 to 63.0 feet

Bentonite (type) 1/4" pellets

Backfill (cuttings) bentonite TD to 81.6 feet

Cement Seal(s) 63 to 15 feet
________ to ________ feet

Cement Composition Portland Type II cement w/5% Quik Gel (bentonite) and 7 gal H2O per sack (94lb)

Protective Casing 3.8 to 0 feet

Protective Casing Type Steel 5" ID, 3.8' length

Other PVC casing has a PVC slip cap at top and a PVC screw cap on bottom

WELL DEVELOPMENT:

Method Air lift

Duration 5 hrs Estimated production 0.9 gpm

Water Appearance cloudy, muddy

Remarks: Development halted at request of Jim Mason, USGS

# LITHOLOGIC LOG
# PROSPECTOR SQUARE

WELL BORING NO. [illegible]  ELEVATION (MSL) ____  BORING COMPLETION DATE [illegible]/88

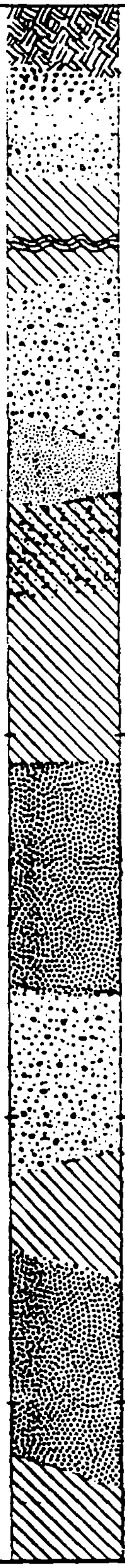
LOCATION Park City, [illegible]
SE/SW/SW SEC 3, T 2 S, R 4 E

DRILLING METHOD hollow stem auger

DRILLING CONTRACTOR Dave's Drilling  WATER LEVEL 1st ENCOUNTERED (ft.BGS) 17.00

RIG TYPE Portadrill  STATIC WATER LEVEL (ft.BGS) [illegible].00

LOGGER [illegible]/DC  (BGS = Below Ground Surface)



| Depth in ft | Lithol. Column | Sample Type ID | LITHOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|
| | | GRAB | SOIL, cly, slty | |
| | | GRAB | GRAVEL | |
| | | GRAB | CLAY, slty, w/4" layer of decomposed straw | |
| | | GRAB | GRAVEL, slty, w/v f sd | |
| 10 | | CORE | GRAVEL, c, w/v f sd & slt; p srtd, rd to sbrd; w/ epidote, serpentinite mnrls, qtz, fld, sh, rk chps | Spl spn [illegible] 10-11.5'; 40% rcvy |
| | | GRAB | SILT, dk brn, w/gvl & v f to f sd | |
| | | CORE | CLAY, dk gy, sticky, v plas; & GRAVEL, c, p srtd, ang to sbrd | Spl spn 15-16.5', 25% rcvy |
| 20 | | CORE | CLAY, dk gy, no plas, v stiff | Spl spn 20-21.5'; 100% rcvy |
| 30 | | CORE | SAND, lt brn, v f to crs, w srtd, sbang to sbrd | Spl spn 30-31.5'; 80% rcvy |
| | | GRAB | SAND, c, w/gvl | |
| 40 | | CORE | GRAVEL, v c to cbls; s srtd, ang to rd | Spl spn 40-41.5'; 40% rcvy |
| 50 | | CORE | CLAY, lt brn, slty, tt | Spl spn 50-51.5'; 30% rcvy |
| | | CORE | SAND, lt brn, c, w/ gvl; slt 30%; and qtz pbls | Spl spn 55-56.5'; 100% rcvy |
| 60 | | | | |
| | | CORE | CLAY, r brn (25% hem), l plas, tt; w/GRAVEL, c | Spl spn 65-66.5'; blw ct 200 ttl; 80% rcvy |

Well: [illegible] [illegible]

| | | | |
|---|---|---|---|
| - 70 | GRAB | SAND, lt brn, slty, w/sm amt cly | |
| - | CORE | SAND, lt brn, f to m | Spl spn 75-76.5' |
| - 80 | CORE | SAND, lt brn, w srtd. grns from f at top of spl to c at bottom of spl barrel; qtz, fld, rx chps | Spl spn 80-81.5': 70% rcvy; "fill"?? |
| - | CORE | TD - 85' | Spl spn 85-86.5': 0% rcvy; refusal @ 85' |

# WELL/PIEZOMETER COMPLETION DIAGRAM

Project: Prospector Square

TDD No.: FC8-8611-34

Location: Park City, Utah

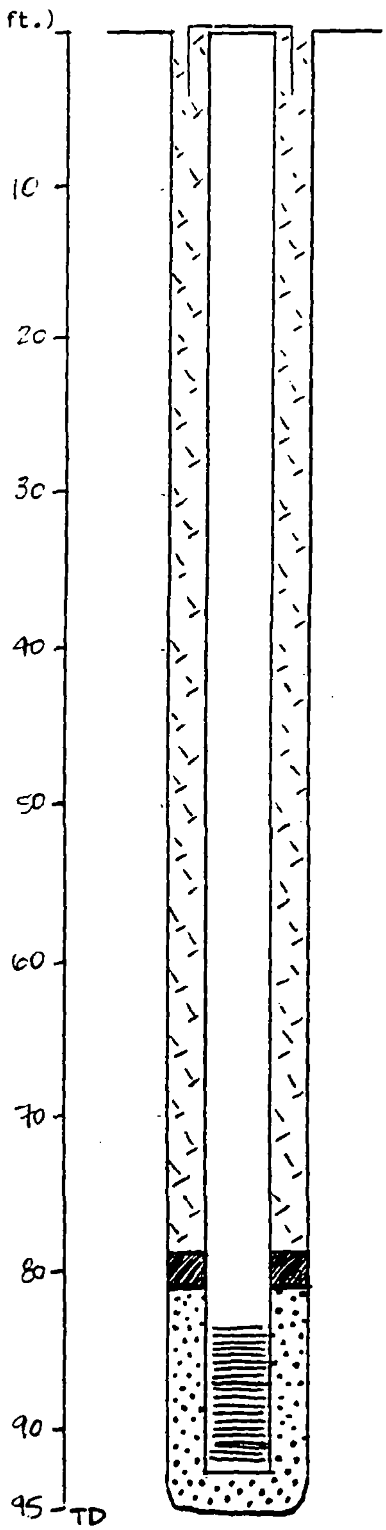
Well Number: PS-MW-5D

Geologist: Mike Carmien

Date(s) of Installation: 2/22/88

Depth to Water: 20 feet (G.L.)

Elevation from Measuring Point:




DRILLING SUMMARY:

Driller: Dave's Drilling
Salt Lake City, Utah

Rig Type: Portadrill, CP 7000

Drilling Method: hollow stem auger

Bit(s): tooth

Drilling Fluid: none used

Surface Casing: 6" steel with locking steel cap

Hollow Stem/Drive Casing I.D. (in.): 4 1/4

Total Depth of Boring (ft.): 95

Borehole Diameter (in.): 7 1/4

WELL DESIGN:

Completion: Above Grade ____ Below Grade ✓

Basis: Geological Log ✓ Geophysical Log ____

Type: split spoon and cuttings samples

Total Depth of Well (ft.): 93

Casing String(s): C=casing S=screen

| | | | |
|---|---|---|---|
| 93 | - | 83 | S |
| 83 | - | 0 | C |

Casing: PVC 2" Sched 80 flush joint

Screen: PVC 2" 20-slot

Centralizers: none used

Gravel/Sand Pack: 95 to 81 feet
10-20 mesh Colorado silica sand

Bentonite Seal(s): 81 to 79 feet
to feet

Bentonite (type): Volclay 1/4" pellets

Backfill (cuttings): — to — feet

Cement Seal(s): 79 to 0 feet
to feet

Cement Composition: Portland Type II cement grout w/5% Quik Gel and 7 gal $H_2O$ per 94-lb sack cement

Protective Casing: -4 to -.6 feet

Protective Casing Type: 6" steel with locking cap

Other:

WELL DEVELOPMENT:

Method: Air lift

Duration: 3.5 hrs Estimated production ____ gpm

Water Appearance: silty w/fines

Remarks:

# LITHOLOGIC LOG
# PROSPECTOR SQUARE



LL BORING NO. PS-MW-5D  ELEVATION (MSL) 0  BORING COMPLETION DATE 02/22/88
CATION SIDEWINDER DRIVE  DRILLING METHOD HOLLOW STEM AUGER

I[illegible]ING CONTRACTOR DAVE'S DRILLING  WATER LEVEL 1st ENCOUNTERED (ft,BGS) 25.00
G TYPE PORTADRILL  STATIC WATER LEVEL (ft,BGS) 20.00
GGER CARMIEN  (BGS = Below Ground Surface)

| Depth in ft | Lithol. Column | Sample Type ID | LITHOLOGIC DESCRIPTION | COMMENTS |
|---|---|---|---|---|
| | | CORE | REFER TO WELL PS-MW-5 FOR DESCRIPTION OF LITHOLOGY FROM 0-12 FT | 8" SURFACE CASING CEMENTED FROM 0-12 FT |
| 2[illegible] | | CORE | CLAY, reddish brown, matrix mixed with fine to coarse sand, angular to subangular. | Split spoon driven from 20-21.5 ft; 40% recovery |
| 3[illegible] | | | | |
| 40 | | CORE | GRAVEL/CLAY/SAND, poorly sorted, 25% gravel, 60% clay, 15% sand; clay reddish brown, sand med to coarse, angular to subangular | Split spoon driven 40-41.5 ft; 60% recovery. |
| 50 | | | | |
| 60 | | CORE | CLAY, reddish brown, plastic, moist, very fine silt within matrix; clay tight, consistent. | Split spoon driven 60-61.5 ft; 100% recovery. |
| 70 | | | | |

Well: PS-MW-5D SIDEWINDER DRIVE

| | | | | |
|---|---|---|---|---|
| 80 | | CORE | CLAY/GRAVEL, clay reddish brown, intermixed with angular to subangular 0-1" sandstone chips; some evidence of Woodside shale; purplish staining. | Split spoon driven 80-81.5 ft; 85% recovery. |
| 90 | | | | |
| | | CORE | Drilling has ceased due to presence of natural gas in bore-hole. | Drilling stopped at request of Park City, USGS, and E & E. |

ABBREVIATIONS USED IN LITHOLOGIC LOG DESCRIPTIONS

| | |
|---|---|
| About | abt |
| Angular | ang |
| Approximate, Approximately | aprox |
| Average | av |
| Biotite | biot |
| Black | blk |
| Boulder | bldr |
| Brown | brn |
| Calcite, Calcareous | calc |
| Carbonaceous | carb |
| Cement, Cemented | cmt |
| Clay, Clayey | cly |
| Coarse | c |
| Cobble | cbl |
| Compact | cpct |
| Crossbedded | xbd |
| Crystal | xl |
| Cuttings | ctgs |
| Dark | dk |
| Decrease | decr |
| Driven | drvn |
| Feldspar | fld |
| Fine | f |
| Fragment | frag |
| Grade | grd |
| Gravel | gvl |
| Green | gn |
| Hard | hd |
| Hematite | hem |
| Increase | incr |
| Interbedded | intbd |
| Light | lt |
| Limonite | lmn |
| Little | ltl |
| Material | mat |
| Matrix | mtx |
| Medium | m |
| Mixed | mxd |
| Part | pt |
| Pebble | pbl |
| Pink | pk |
| Plastic | plas |
| Poor, Poorly | p |
| Purple | purp |
| Quartz | qtz |
| Quartzite | qtzt |
| Recovery | rcvy |

## ABBREVIATIONS USED IN LITHOLOGIC LOG DESCRIPTIONS (CONTINUED)

| | |
|---|---|
| Sand | sd |
| Sandy | sdy |
| Shale | sh |
| Silt | slt |
| Silty | slty |
| Size | sz |
| Small | s |
| Soft | sft |
| Sorted | srtd |
| Split | spl |
| Spoon | spn |
| Stain | stn |
| Streak | str |
| Subangular | sbang |
| Subrounded | sbrd |
| Tight | tt |
| Very | v |
| Weather | wthr |
| Weathered | wthrd |
| Well | w |
| White | wh |
| With | w/ |
| Without | w/o |
| Yellow | y |

ATTACHMENT B
FIELD AUDIT REPORT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET—SUITE 500
DENVER, COLORADO 80202-2405

SEP 2 8 1987

REF: 8ES-ES

MEMORANDUM

TO: Paula Schmittdehl, 8HWM-SR
Project Officer

FROM: Lester D. Sprenger, 8ES-TI
Field Quality Assurance Officer

SUBJECT: Field QA Audit of the Silver Creek Tailings Well Superfund Sampling Activity

I have attached for your use the Field QA Audit on the subject plan. The sampling activity was carried out very effectively and should result in valid and defensible data.

Attachment

cc: (w/attachment) Jim Littlejohn, 8ES-AS
(w/o attachment) Marshall Payne, 8ES-ES

# UNIVERSAL
# FIELD OVERVIEW
# CHECKLIST

Site Name: Silver Creek Tailings

Location: Park City, Utah

Study Date(s): 8/31 and 9/1/87

Facility Contact: Ron Ivie

Phone Number: 649-9321

Contractor/State Personnel: Jim Mason - USGS

Address: Salt Lake City, Utah

Phone Number:

Project Leader: Muhammad Slam - UBSHW

Other Contractor/State Personnel:

ESD Overview Personnel: Lester D. Sprenger

Other Personnel and Affiliation:

Ken Thompson - USGS
Mike Long - UBSHW
Robert Eddy - E&E
Dan Kenney - E&E
Paula Schmittdehl - EPA

PLANNING AND PREPARATION

| | Y or N |
|---|---|
| 1) Was a study plan, work plan, site operations plan, etc. issued for this investigation? | Y |
| Date Issued 6/22/87 | |
| If YES: | |
| Was the study plan reviewed by ESD? | Y |
| Was the study plan acceptable? | Y |

SAMPLING

General Procedures

| | |
|---|---|
| 1) Were sampling locations properly selected? | Y |
| If No, explain | |
| 2) Were samples collected starting with the least likely contaminated and proceeding to the most likely contaminated? Remarks | Y |
| 3) Were new disposable rubber gloves worn during collection of all samples? Remarks | Y |
| 4) Was sampling equipment wrapped in aluminum foil and protected from possible contamination prior to sample collection? | N |
| If No, explain Sample equipment is kept in clean carrying bags. | |
| 5) If equipment was cleaned in the field, were proper procedures used? (This includes storage method for rinse water and solvents) | Y |
| If No, explain | |
| 6) What field instruments were used during this investigation? pH meter and conductivity meter | |

| | | Y or N |
|---|---|---|
| 7) | Were field instruments properly calibrated? | y |
| | If No, explain | |
| 8) | Were calibration procedures documented in the field notes? Remarks | y |
| 9) | Were the samples chemically field preserved? If No, explain | y |
| 10) | Were the samples iced? | y |
| 11) | Were samples for selected parameters field filtered? | Y |
| | If Yes, list parameters and describe procedures. Meters - 0.45 micron filter using a peristaltic pump. | |

Well Sampling

| | | |
|---|---|---|
| 1) | Was depth of well determined? | Y |
| 2) | Was depth to water determined? | Y |
| 3) | Were the above depths to water converted to water level elevations common to all wells? | Y |
| | Describe how the depths were determined Surveyed by J.J. Johnson, Park City, Utah. | |
| 4) | How was the volume of water originally present in each well determined? with a steel tape measure | |
| 5) | Was the volume determined correctly? | Y |
| 6) | How was completeness of purging determined? Volume Measure X Time/Flow rate ___ Cond./pH/T ___ | |
| 7) | Was a sufficient volume purged? | Y |
| | Was the well over-purged? | N |

| | | Y or N |
|---|---|---|
| 8) | Was a dedicated (in-place) pump utilized? | N |

If no, describe the method of purging (bailer - include type and construction material, pump - include type) A PVC Brainard Kelman pump was used.

9) How were the samples collected?

Bailer______

Pump X

Combination______

Construction material of bailer:______

Design of bailer

Open Top______

Closed Top______

Other______

10) If a pump was used, describe how it was cleaned before and/or between wells. Soapy water, rinsed with water.

| | | |
|---|---|---|
| 11) | Was the sample properly transferred from bailer to sample bottle (i.e., was the purgeable sample agitated, etc.)? | Y |
| 12) | Was the rope or line allowed to touch the ground? | N/A |
| 13) | Was any wetted rope or line discarded after use at each well? | N/A |
| 14) | How many wells were sampled? | 7 |

Surface Water Sampling

| | | |
|---|---|---|
| 1) | What procedures and equipment were used to collect surface water samples? | N/A |

Who collected samples?______

| | | |
|---|---|---|
| 2) | Did the samplers wade in the stream during sample collection? | N/A |
| | If Yes: | |
| | Did the sampler face upstream while collecting sample? | N/A |
| | Did the sampler insure that roiled sediments were not collected along with water sample? | N/A |

Y or N

3) Note any deficiencies observed during the collection of the surface water samples ______________________________

## Waste, Sludge, Soil/Sediment Sampling

1) What procedures including equipment were used to collect soil/sediment samples? ______________________________

2) Were the soil/sediment samples well mixed prior to placing the sample in the sample container? N/A

3) Note any deficiencies observed during the collection of the soil/sediment samples ______________________________

Total number of samples collected ______________________________

## Other Sampling

1) What other types of samples were collected during this investigation? ______________________________

2) What procedures were used for the collection of these samples? ______________________________

Who collected samples?

## QUALITY ASSURANCE/QUALITY CONTROL

Y or N

(While all of these QA/QC procedures are not necessarily used, please identify the specific techniques which were employed by sampling personnel.)

1) Did the sampling personnel utilize any field trip blanks? Y

Y or N

2) Did the sampling personnel utilize preservative blanks? N

If Yes, to either of the above questions, list the types and handling of the blanks

3) Were any equipment blanks collected? Y

If Yes, list: Deionized organic-free water was poured through sampling equipment - 1 sample collected

4) Were any duplicate samples collected? Y

If Yes, list the types (parameter coverage, etc.) and describe their handling. one sample for all parameters - handled as a regular sample

5) Were any spiked samples utilized? N

If Yes, list the types (parameter coverage, etc.) and describe their handling.

FIELD DOCUMENTATION AND CHAIN-OF-CUSTODY

1) Were split samples offered to the site owner or facility representative? Y

2) Was a receipt for samples given to the site owner or facility representative prior to leaving the site? N/A

3) Were chain-of-custody records completed for all samples? Y

4) Were sample tag numbers and laboratory traffic report form numbers cross referenced to chain-of-custody forms? Y

5) Were chain-of-custody form numbers recorded in the field log book? Y

6) Were all samples properly sealed at the time of collection? Y

7) Were samples locked in vehicle or kept in a secure place after collection? Y

Y or N

8) Were all sample tags and chain-of-custody forms signed by sample collector(s)? Y

9) Were sampling locations adequately documented? Y

If No, explain ______

10) Was sampling documented with photographs? Y

If Yes, was a photolog maintained?

11) Were the samples shipped to a contract laboratory? N

If Yes:

Were the traffic report forms filled out properly? ______

Were the samples properly packed for shipment? ______

STATE REGULATORY AGENCY PERSONNEL

Y or N

Qualifications of investigative/sampling personnel (training and experience) by names ______

Have investigative/sampling personnel received sampling technique and equipment training? Y

Have personnel received safety training? Y

If yes to either of the above questions, list where and when the training was received and who provided the instruction. At State offices once a year by EPA or EPA contractor.

Do the investigative/sampling personnel undergo periodic refresher training regarding safety? Y

Did the investigative/sampling personnel have appropriate safety equipment in their possession during this inspection? Y

If YES, describe the equipment which was available and/or used during this inspection. HNu

If NO, list the equipment which was needed. ______

**Y or N**

Have the investigative/sampling personnel been categorized as to the type of inspections they can conduct? Y

Have the investigative/sampling personnel had comprehensive physicals? Y

Do the sampling personnel participate in a medical monitoring program (i.e., periodic follow-up physicals)? Y

If yes, how often? Yearly

Do the investigative/sampling personnel perform the entire RCRA Interim Status Inspection or merely collect samples? N/A

If the personnel only collect samples, how are their sampling efforts coordinated with the rest of the inspection? N/A

If state personnel did not collect samples, did they thoroughly evaluate sampling procedures used by facility? N/A

If facility collected samples, did state representatives accept a split sample(s)? N/A

SOP (Applies only to state overviews)

Has the state developed an ~~SOP~~ QAPP for ~~RCRA~~ CERCLA field sampling? Y

Did the state personnel have a copy of the ~~SOP~~ QAPP with them during this inspection? N

What does the ~~SOP~~ QAPP Cover?

- Field inspections in general (sampling techniques, etc.)
- Sample handling X
- Sample I.D. and chain-of-custody X
- Uses and limitations of various types of bailers and pumps X
- Equipment cleaning X
- Field measurements (cond., pH, T, etc.) X
- Calibration of field instruments X
- Other ______

Did they follow their ~~SOP~~ QAPP during this inspection? Y

GENERAL COMMENTS/OBSERVATIONS

The sampling went very well. The data from this sampling activity should be valid and defensible.

At the first sampling site I did have them cut off the brass end of a rubber garden hose which was attached to the well pump. Since the sample plan did not call for organic analysis I had no objection to the use of a rubber garden hose, however, had they been taking samples for organic analysis, I would have had them change to teflon tubing.

# ATTACHMENT C
# MODIFICATIONS TO WORK PLAN

# ADDITIONAL WORK NOT INCLUDED IN ORIGINAL WORK PLAN

During drilling operations of the original 11 monitoring wells, the need for two additional monitoring wells became apparent. Due to the shallow depth at which consolidated rock was encountered in the upgradient, deep, alluvial well, a second deep well was completed to insure that a true representation of the quality of water at depth would be obtained.

Preliminary water-level data from the completed monitoring wells indicated a possible component of ground-water flow in a northeasterly direction, away from the tailings area, in addition to the component of flow along Silver Creek. Therefore, to insure representation of downgradient conditions, an additional monitoring well was completed near the Pace-Homer Ditch, north of the tailings area.

At the request of the U.S. Environmental Protection Agency, additional aquifer characterization was completed in the Silver Creek Tailings area. The additional work was designed to determine whether there is a connection between the unconsolidated valley-fill and the consolidated-rock aquifer used as a municipal water supply. Also, the transmissive properties of the unconsolidated valley-fill would be characterized from lithologic descriptions and slug tests. Three elements of work were included in this phase. First, five, deep, alluvial wells were completed near tne consolidated rock. Three of these wells will be used to characterize the lithology and quality of water at depth in the tailings area. The remaining two additional wells were located between the tailings area and the Parks Meadows Municipal Well. These wells were monitored during an interference test.

The second element of the additional aquifer characterization involved a 72-hour interference test designed to determine effects of pumping the Park Meadows Well on water levels in the Thaynes Formation, Woodside Shale,unconsolidated valley-fill, and on discharge of springs and streams in the area. All wells, springs, and streams were monitored during the test.

The final element was designed to obtain estimates of horizontal hydraulic conductivity from each of the monitoring wells. These estimates can be derived from data obtained from slug tests of each well. Rather than using a slug of water injected into each well, water can be displaced within the well by a cylinder, and recovery can be monitored.

ATTACHMENT D
OUTLINE FOR STUDENT T-TEST

R450-1-F
APPENDIX D
TESTS FOR SIGNIFICANCE

As required in 7.13.4.(b), the owner or operator shall use the Student's t-test to determine statistically significant changes in the concentration or value of an indicator parameter in periodic groundwater samples when compared to the initial background concentration or value of that indicator parameter. The comparison shall consider individually each of the wells in the monitoring system. For three of the indicator parameters (specific conductance, total organic carbon, and total organic halogen) a single-tailed Student's t-test shall be used to test at the 0.01 level of significance for significant increases over background. The difference test for pH shall be a two-tailed Student's t-test at the overall 0.01 level of significance.

The Student's t-test involves calculation of the value of a t-statistic for each comparison of the mean (average) concentration or value (based on a minimum of four replicate measurements) of an indicator parameter with its initial background concentration or value. The calculated value of the t-statistic shall then be compared to the value of the t-statistic found in a table for t-test of significance at the specified level of significance. A calculated value of t which exceeds the value of t found in the table indicates a statistically significant change in the concentration or value of the indicator parameter.

Formulae for calculation of the t-statistic and tables for t-test of significance can be found in most introductory statistics texts.

Cochran's Approximation for the Behrens-Fisher Students[1] t-test.

Using all the available background data ($N_b$ readings), calculate the background mean ($X_B$) and background variance ($S_B{}^2$). For the single monitoring well under investigation ($n_m$ reading), calculate the monitoring mean ($x_m$) and monitoring variance ($S_m{}^2$).

For any set of data ($X_1$, $X_2$ . . . $X_n$) the mean is calculated by:

$$\bar{X} = \frac{X_1 + X_2 \ldots\ldots\ldots\ldots + X_n}{n}$$

and the variance is calculated by:

$$s^2 = \frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 \ldots\ldots + (X_n - \bar{X})^2}{n-1}$$

Where "n" denotes the number of observations in the set of data.

The t-test uses these data summary measures to calculate a t-statistic ($t^*$) and a comparison t-statistic ($t_c$). The $t^*$ value is compared to the $t_c$ value and a conclusion reached as to whether there has been a statistically significant change in any indicator parameter.

The t-statistic for all parazmeters except pH and a similar monitoring parameters is

$$t^* = \frac{X_m - \bar{X}_B}{\sqrt{\dfrac{S_m^2}{n_m} + \dfrac{S_B^2}{n_B}}}$$

If the value of this t-statistic is negative then there is not significant difference between the monitoring data and background data. It should be noted that significantly small negative values may be indicative of a failure of the assumption made for test validity or errors have been made in collecting the background data.

The t-statistic ($t_c$), against which t* will be compared, necessitates finding $t_B$ and $t_m$ from standard (one-tailed) tables where,

$t_B$ = t-tables with ($n_B$ - 1) degrees of freedom, at the 0.05 level of significance.

$t_m$ = t-tables with ($n_m$ - 1) degrees of freedom, at the 0.05 level of significance.

Finally, the special weightings $W_B$ and $W_m$ are defined as:

$$W_B = \frac{S_B^2}{n_B} \quad \text{and} \quad W_m = \frac{S_m^2}{n_m}$$

and so the comparison t-statistic is:

$$t_c = \frac{W_B t_B + W_m t_m}{W_B + W_m}$$

The t-statistic (t*) is now compared with the comparison t-statistic ($t_c$) using the following decision rule:

If t* is equal to or larger than $t_c$ then conclude that there most likely has been a significant increase in this specific parameter.

If t* is less than $t_c$ then conclude that most likely there has not been a change in this specific parameter.

The t-statistic for testing pH and similar monitoring parameters is constructed in the same manner as previously described except the negative sign (if any) is discarded and the caveat concerning the negative value is ignored. The standard (two-tailed) tables are used in the construction $t_c$ for pH and similar monitoring parameters conclude that there most likely has been no change.

A further discussion of the test may be found in Statistical Methods (6th Edition, Section 4.14) by G.W. Snedecor and W.G. Cochran, or Principles and Procedures of Statistics (1st Edition, Section 5.8) by R.G.D. Steel and J. H. Torrie.

STANDARD T-TABLES 0.05 LEVEL OF SIGNIFICANCE

| Degrees of Freedom | t-values (one-tail) | t-values (two-tail) |
|---|---|---|
| 1. | 6.314 | 12.706 |
| 2. | 2.920 | 4.303 |
| 3. | 2.353 | 3.182 |
| 4. | 2.132 | 2.776 |
| 5. | 2.015 | 2.571 |
| 6. | 1.943 | 2.447 |
| 7. | 1.895 | 2.365 |
| 8. | 1.860 | 2.306 |
| 9. | 1.833 | 2.262 |

| | | |
|---|---|---|
| 10. | 1.812 | 2.228 |
| 11. | 1.796 | 2.201 |
| 12. | 1.782 | 2.179 |
| 13. | 1.771 | 2.160 |
| 14. | 1.761 | 2.145 |
| 15. | 1.753 | 2.131 |
| 16. | 1.746 | 2.120 |
| 17. | 1.740 | 2.110 |
| 18. | 1.734 | 2.101 |
| 19. | 1.729 | 2.093 |
| 20. | 1.725 | 2.086 |
| 21. | 1.721 | 2.080 |
| 22. | 1.717 | 2.074 |
| 23. | 1.714 | 2.069 |
| 24. | 1.711 | 2.064 |
| 25. | 1.708 | 2.060 |
| 30. | 1.697 | 2.042 |
| 40. | 1.684 | 2.021 |

Adopted from Table III of"Statistical Tables for Biological, Agricultural, and Medical Research" (1947, R.A. Fisher and F. Yates).

KEY: Hazardous Waste

ATTACHMENT E
INTERFERENCE TEST DATA

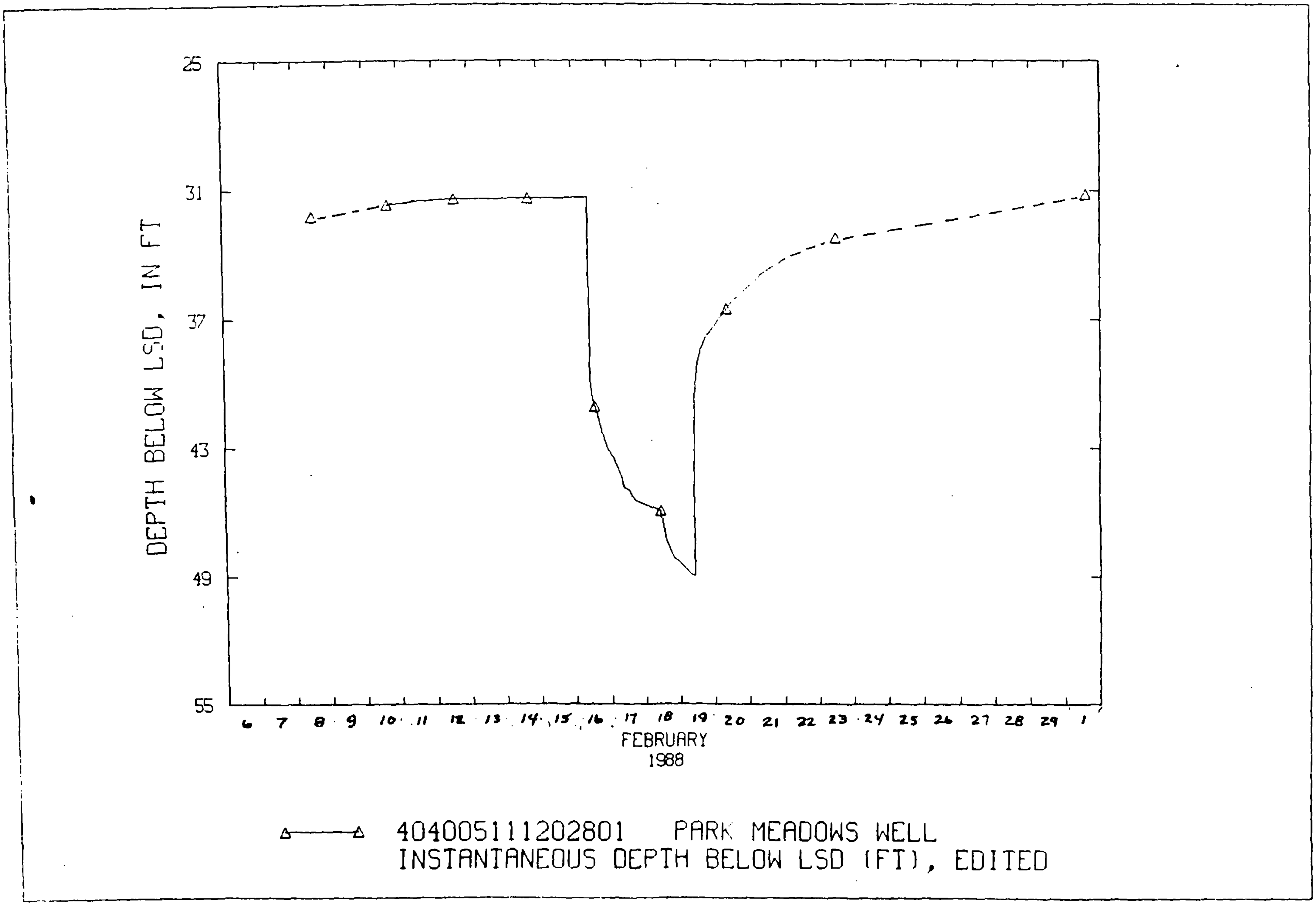



Figure 6.--Fluctuations during interference test (dashed where estimated).

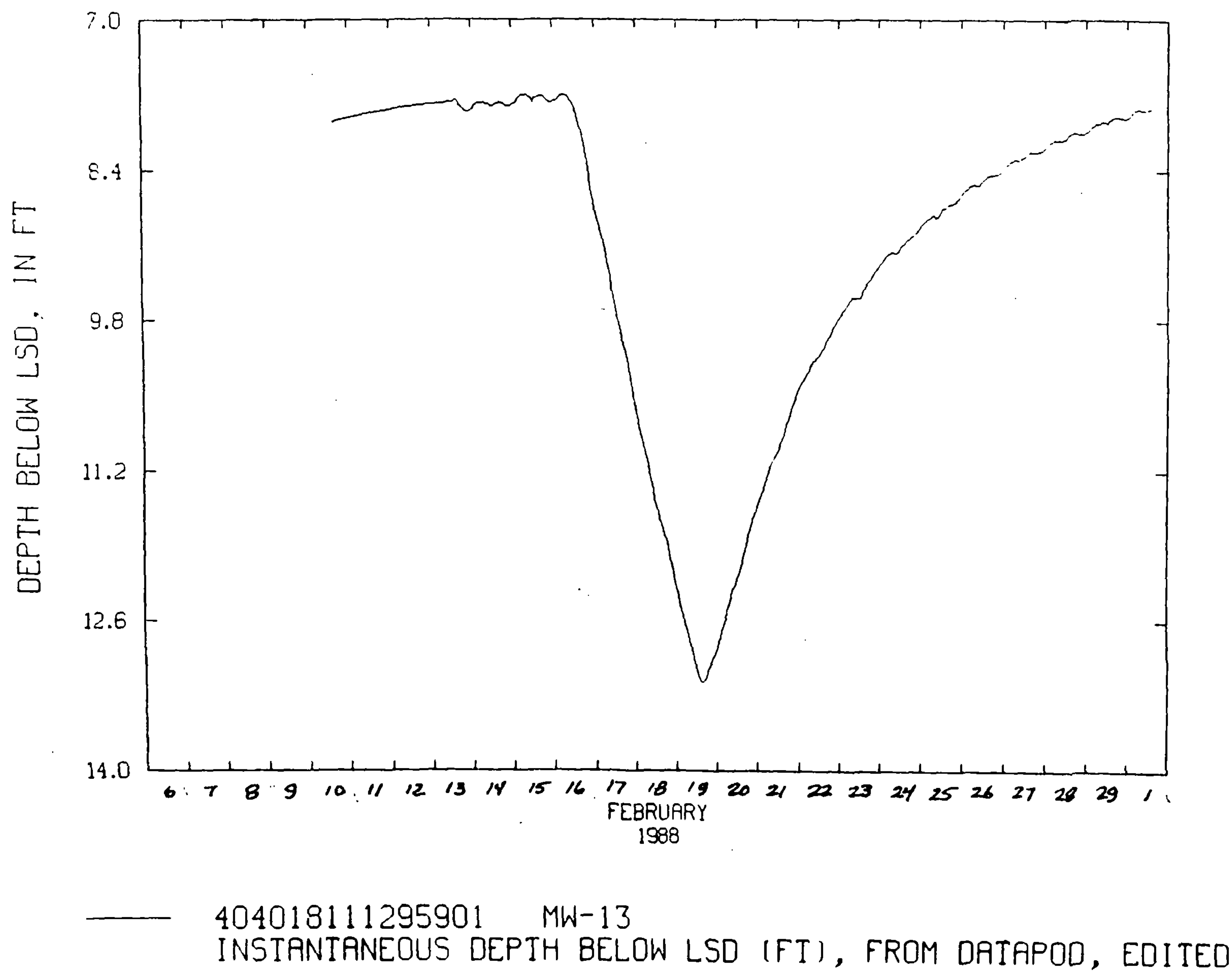



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

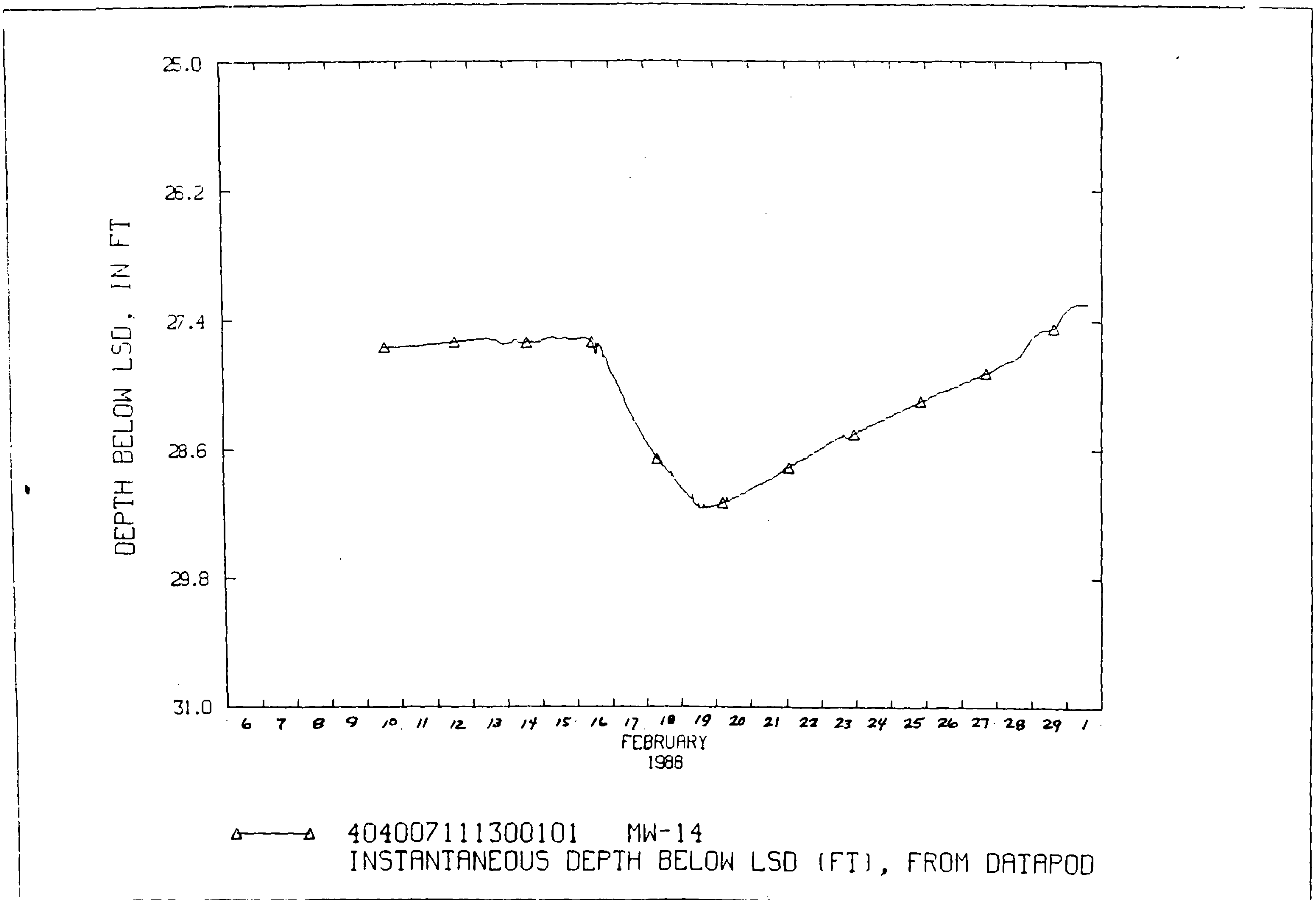



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

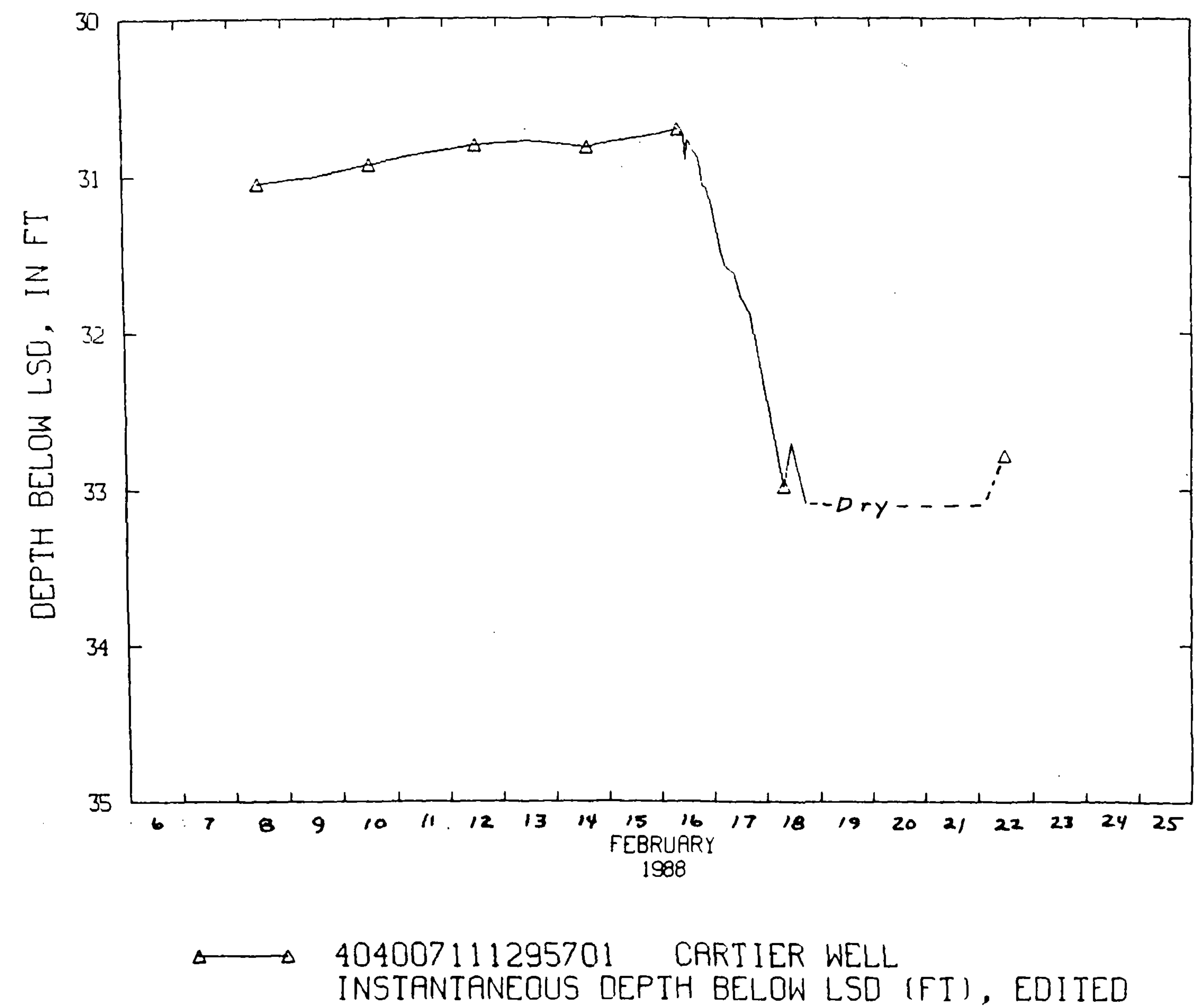



**Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.**

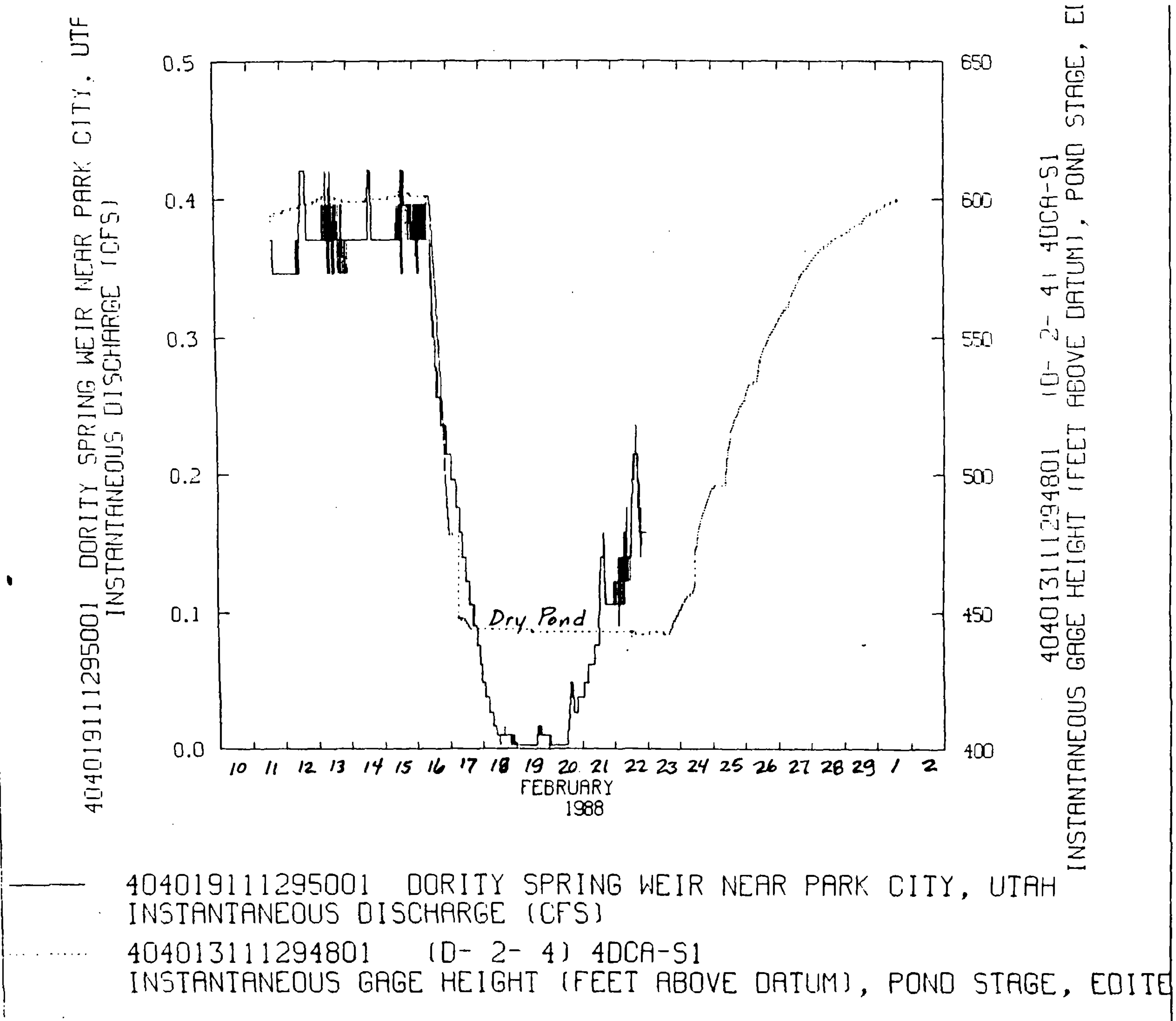



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

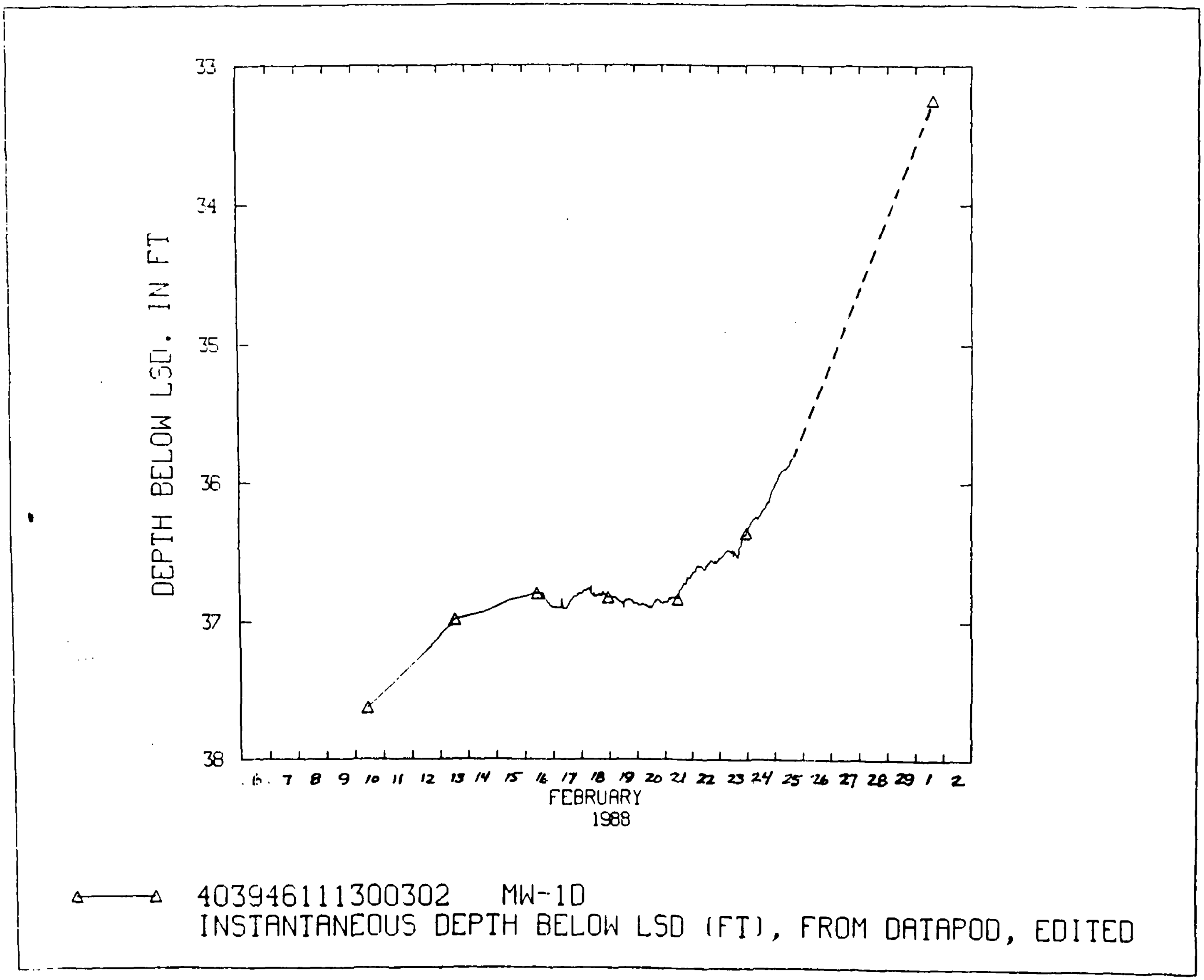



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

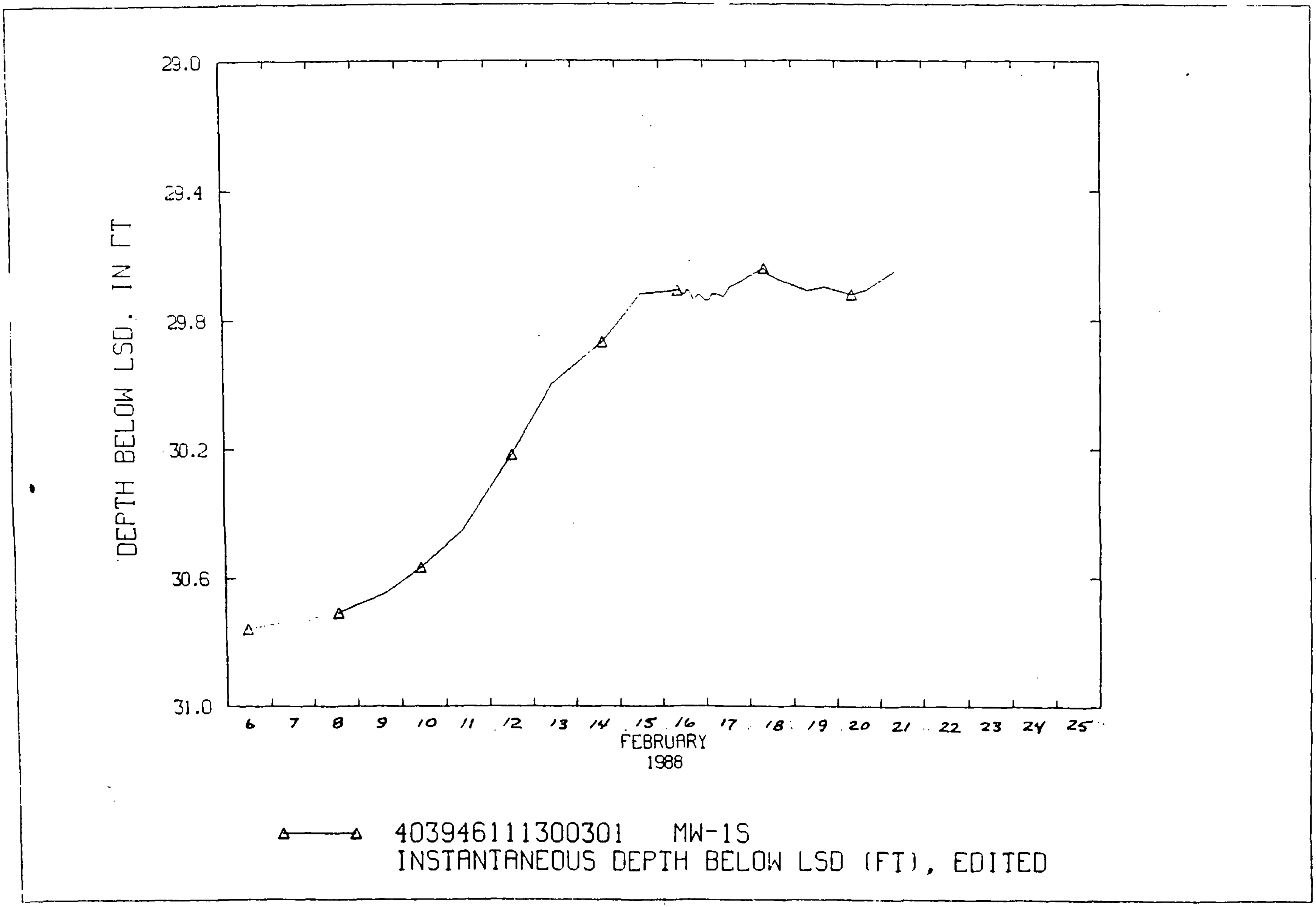



**Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.**

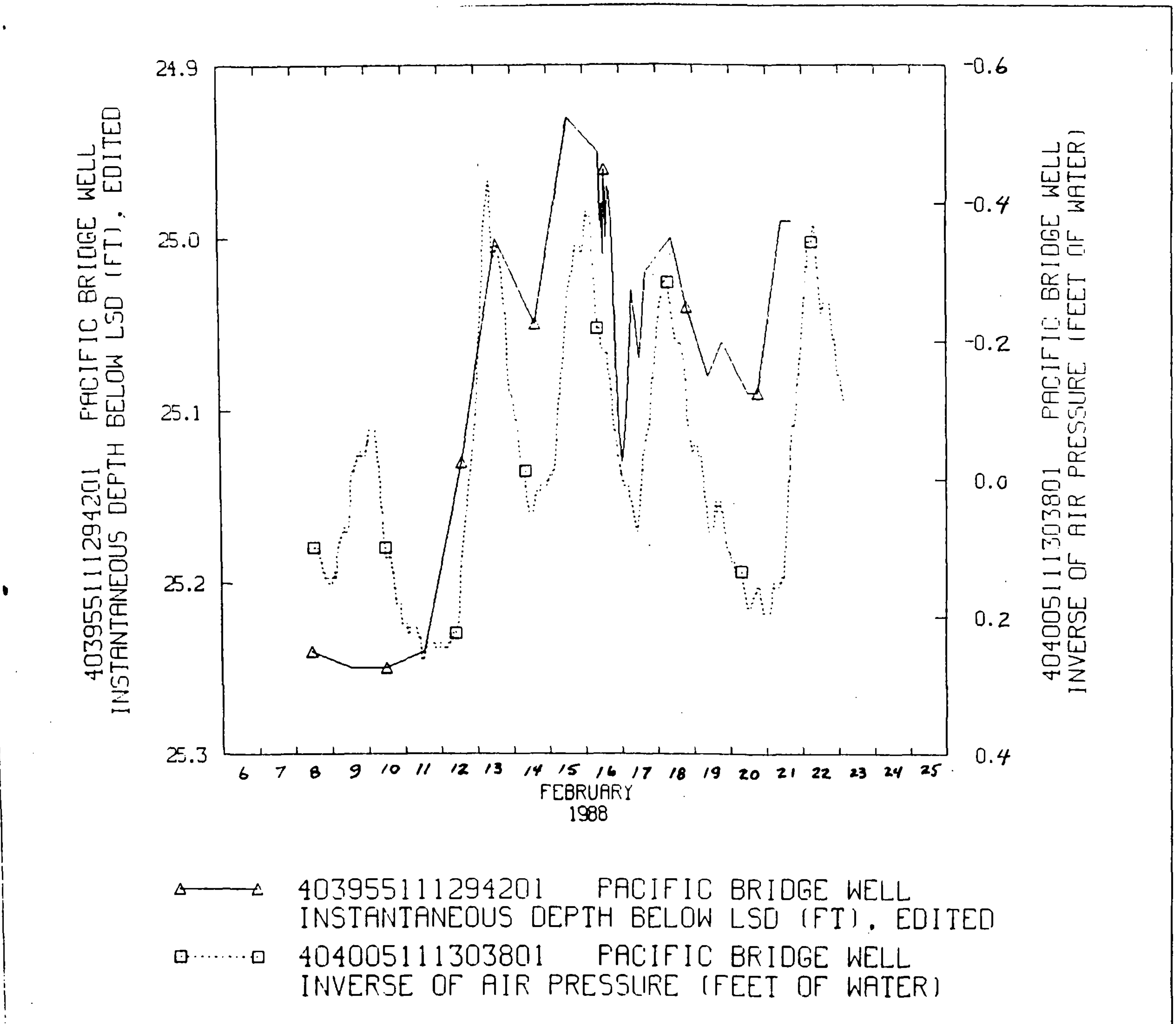



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

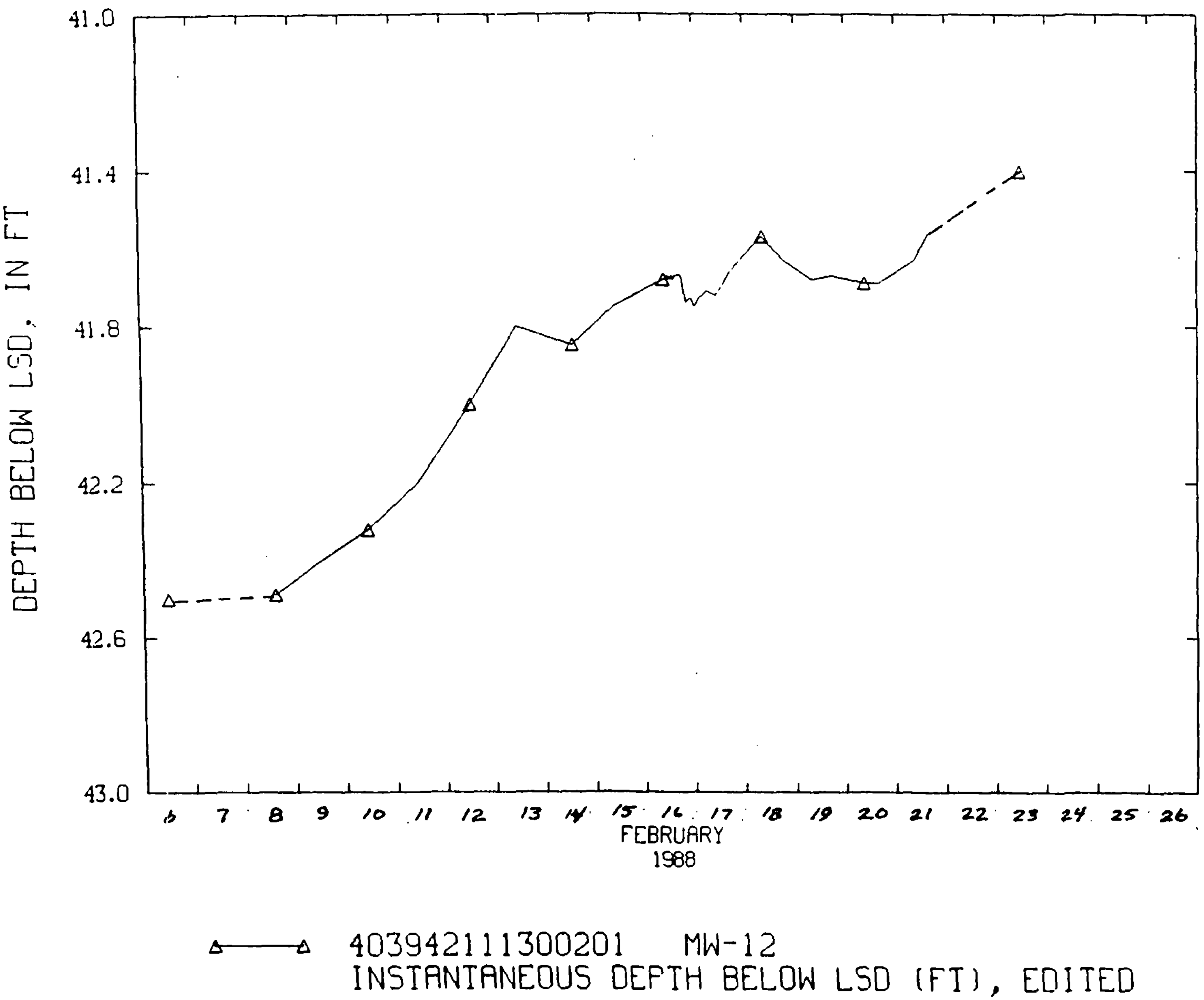



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

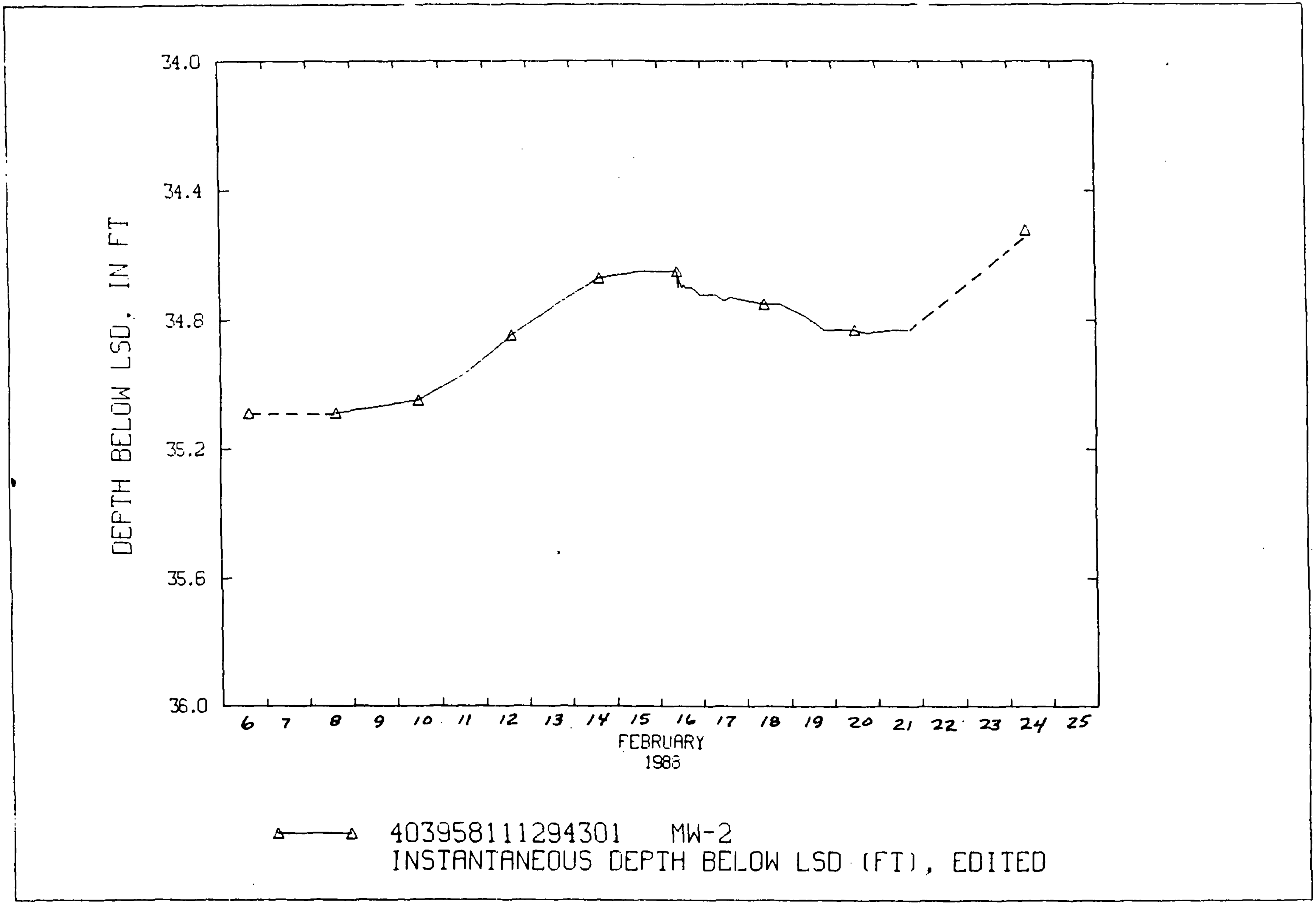



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

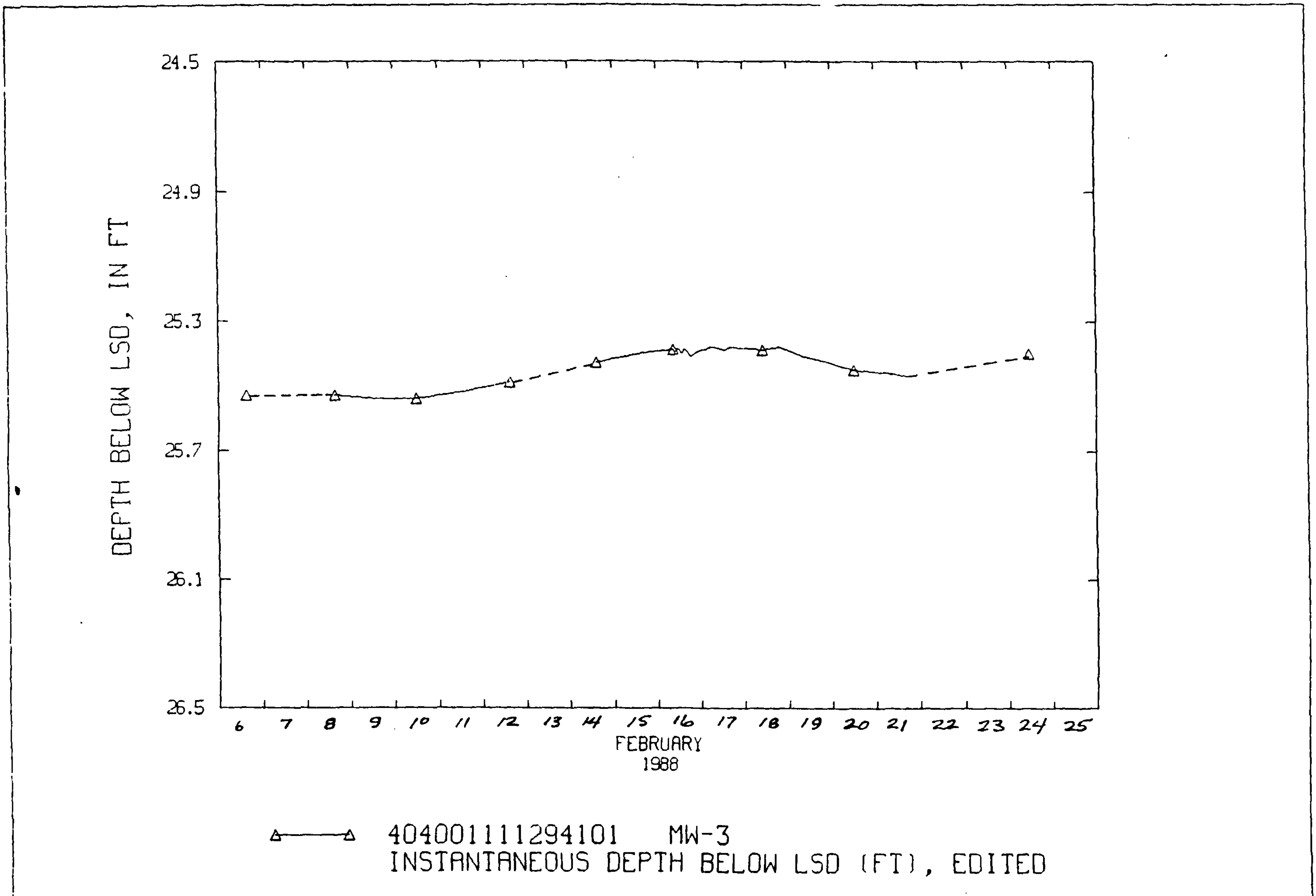



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

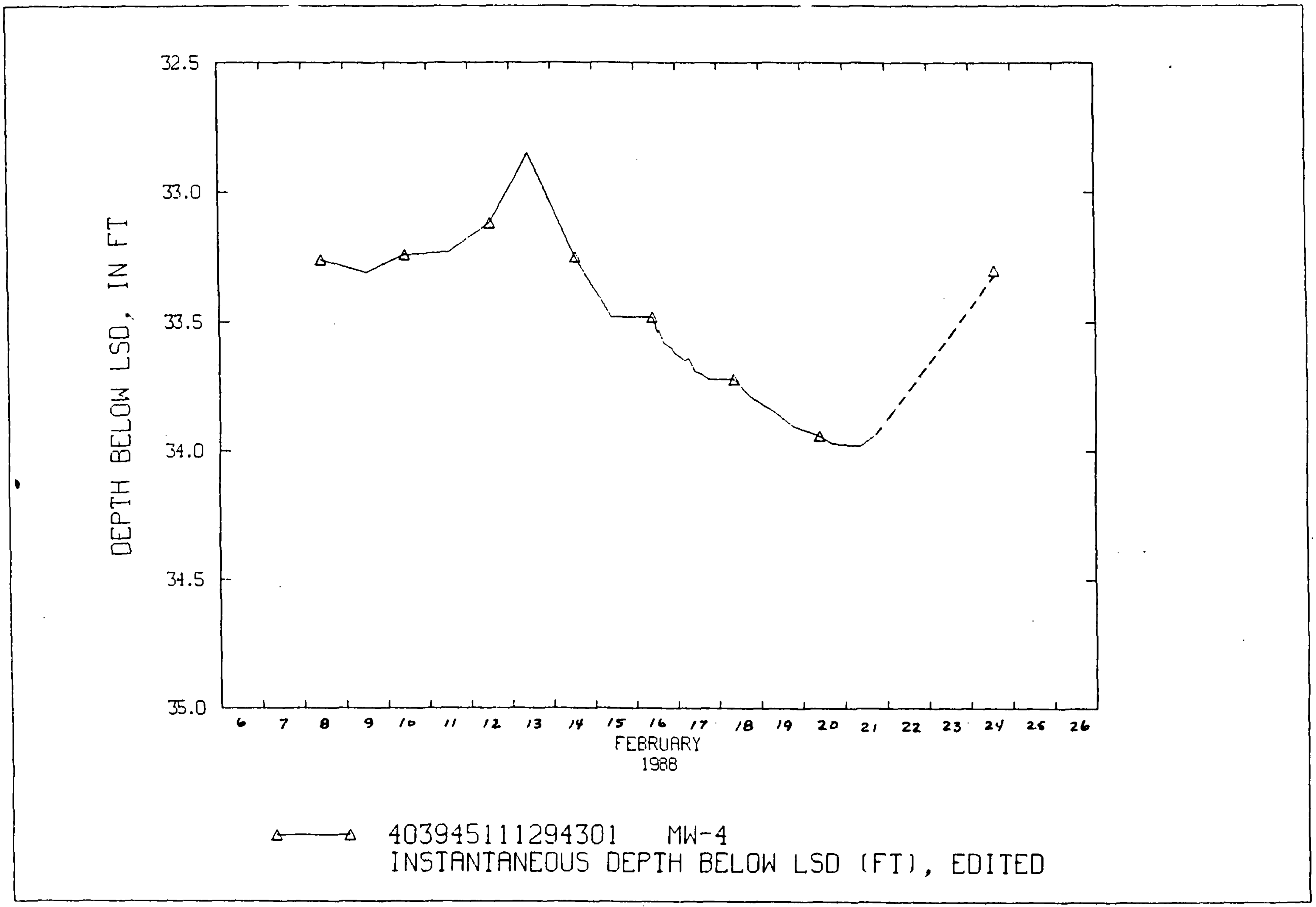



**Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.**

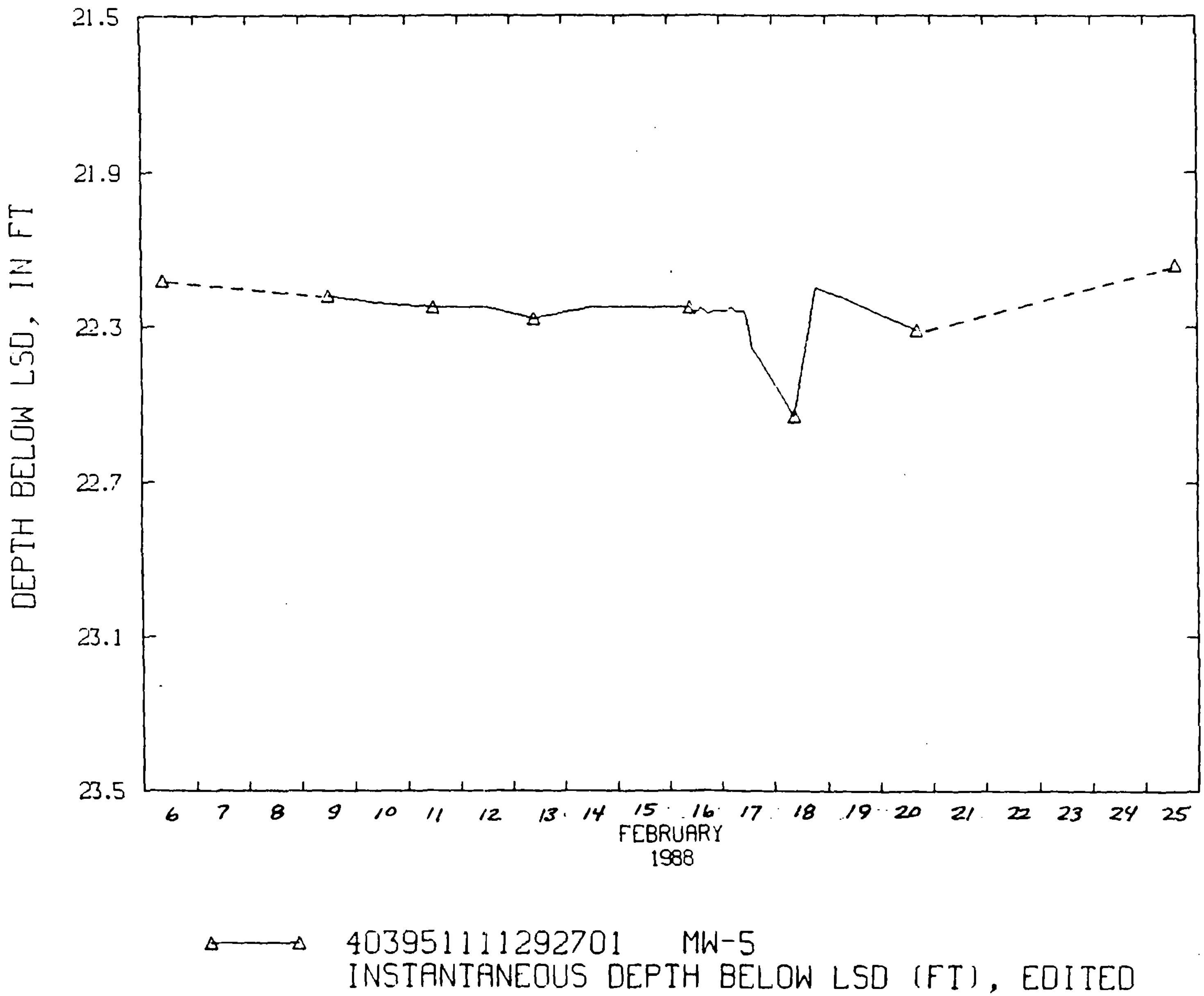



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

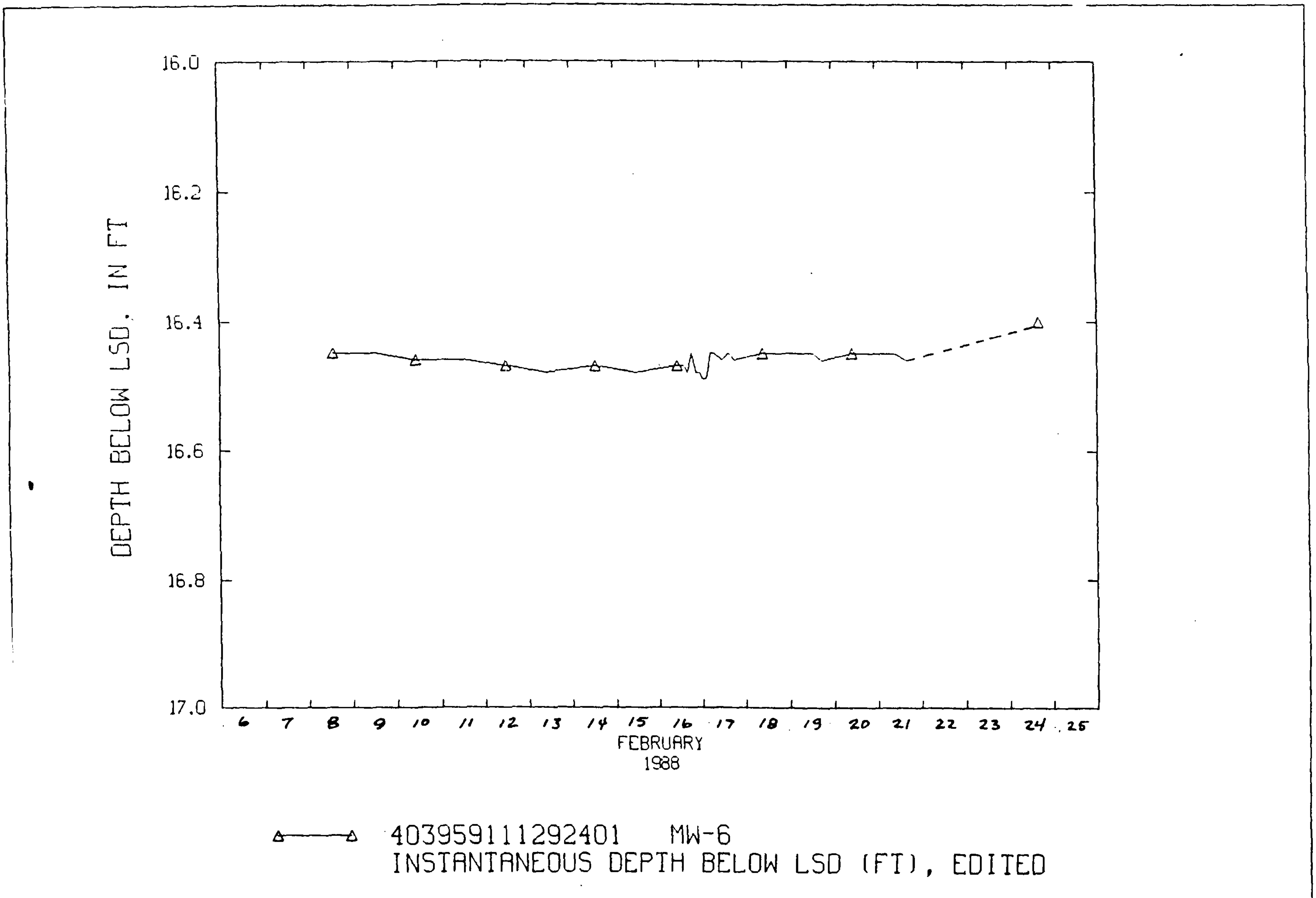



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

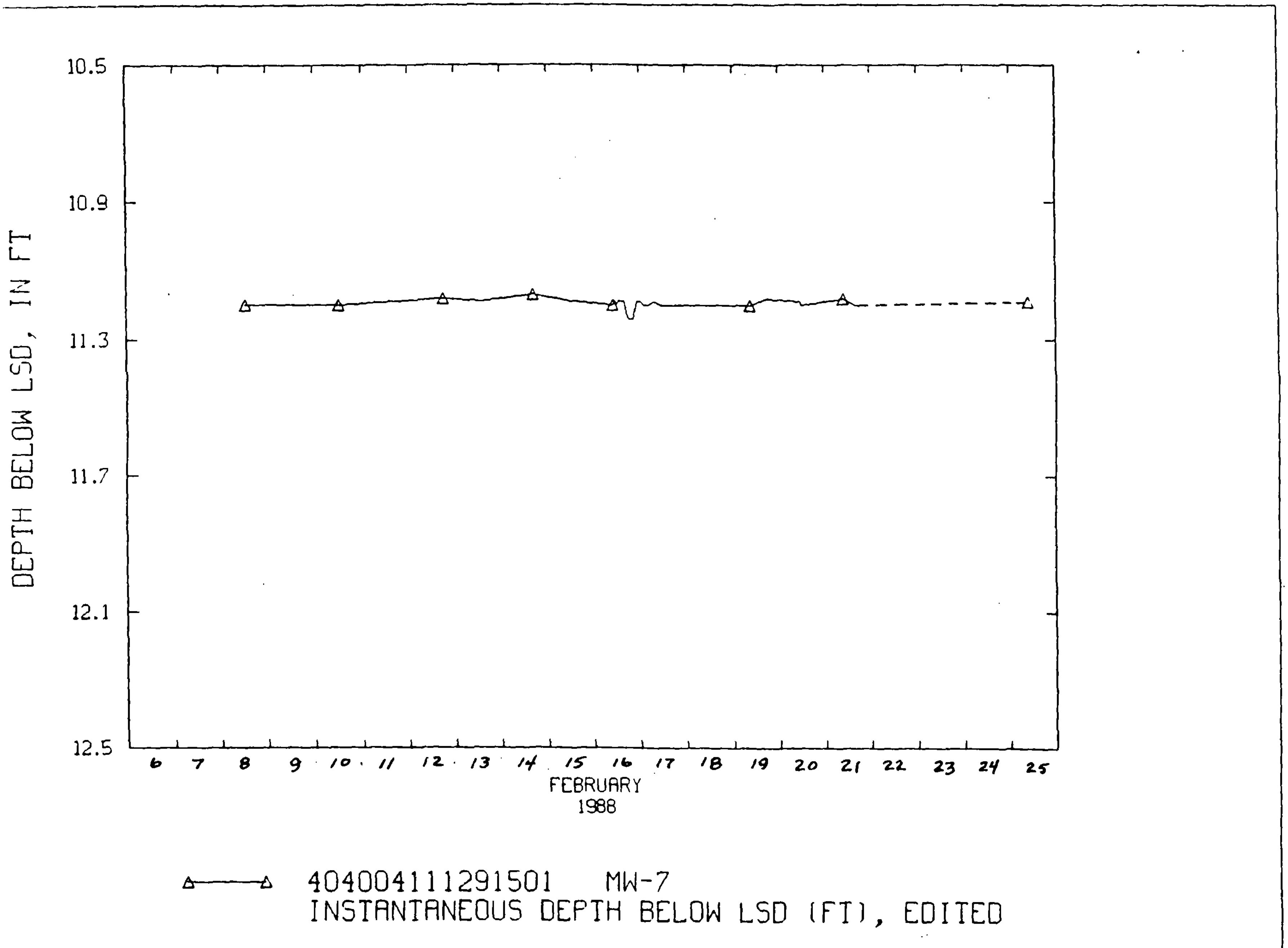



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

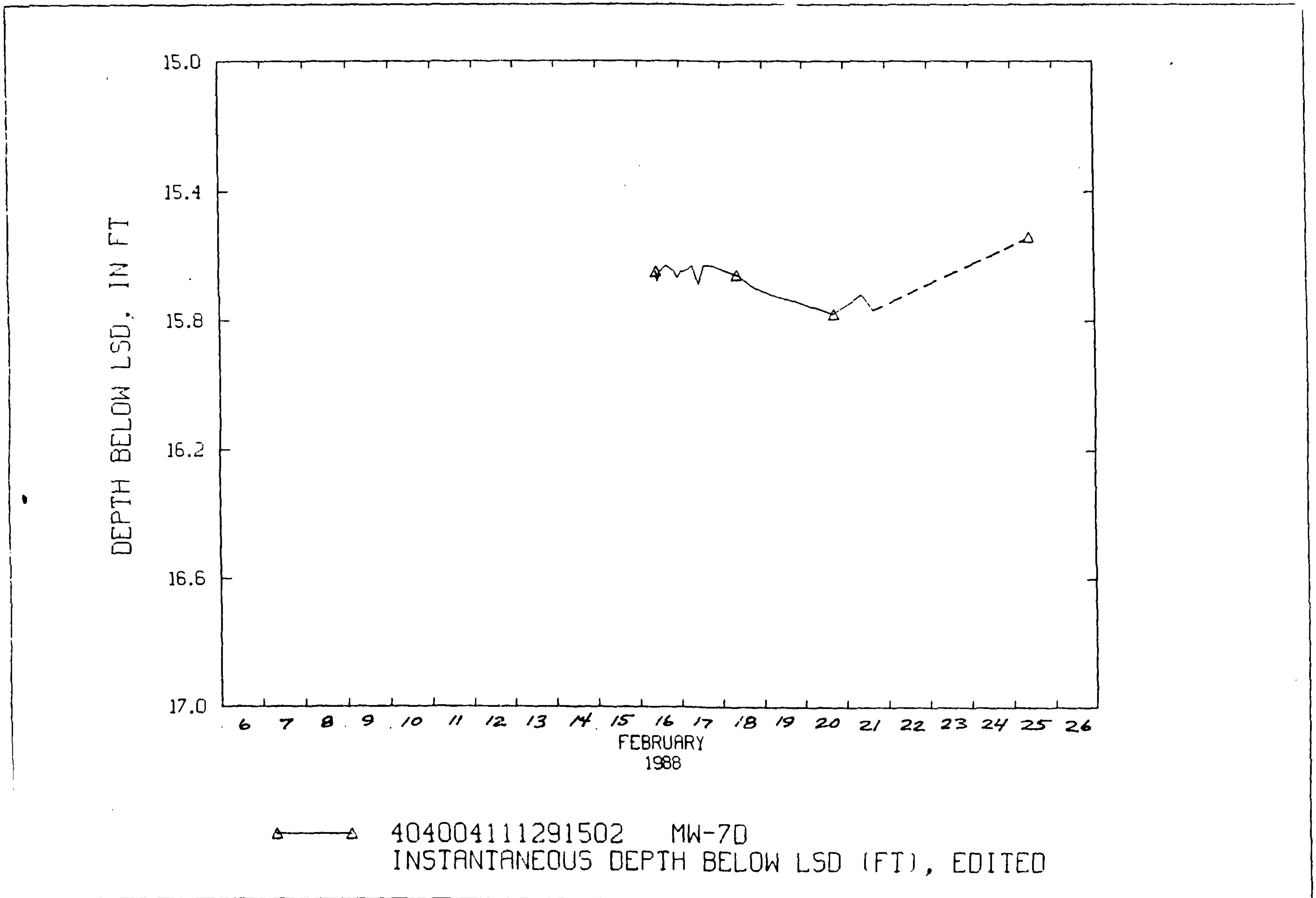



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

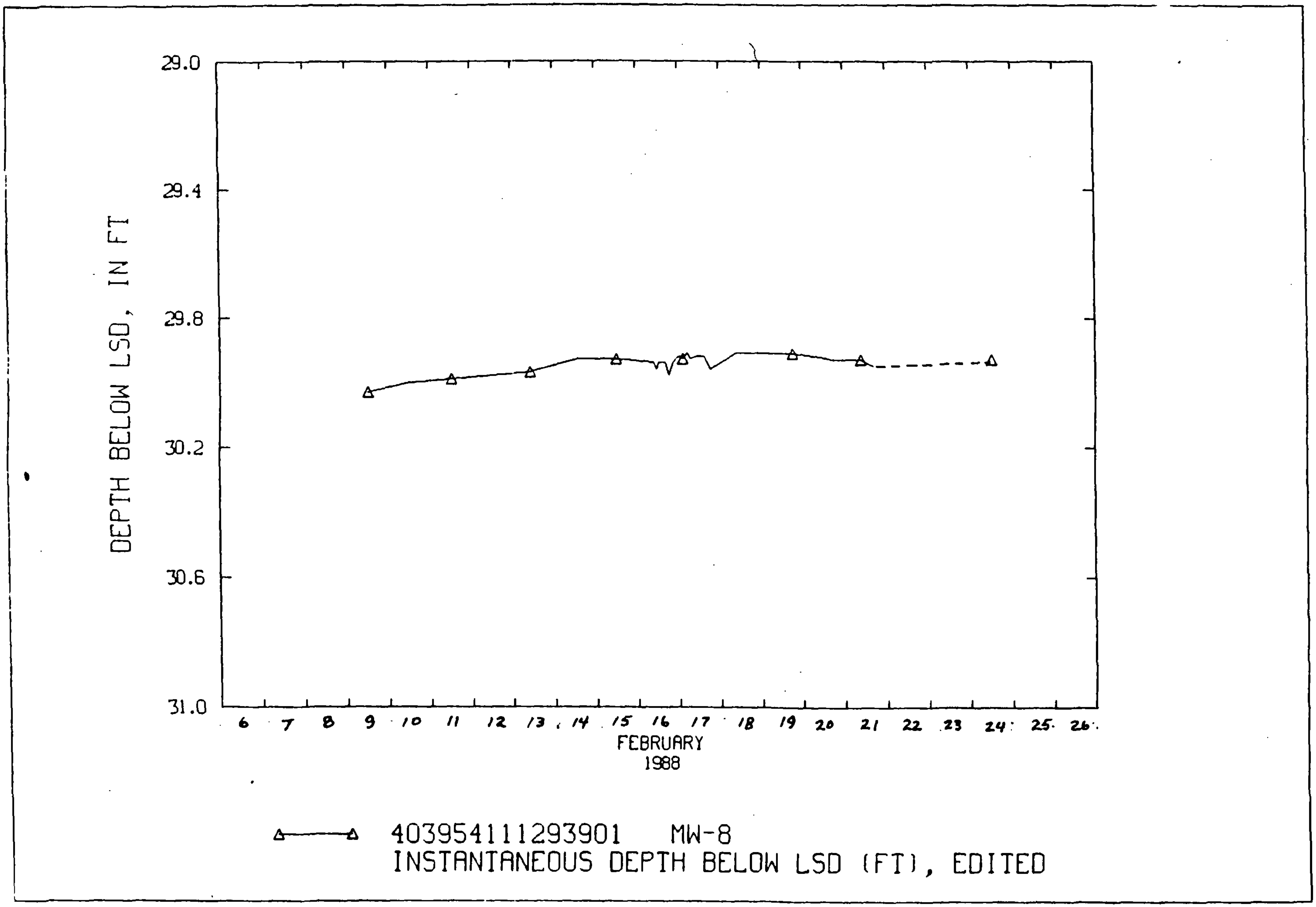



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

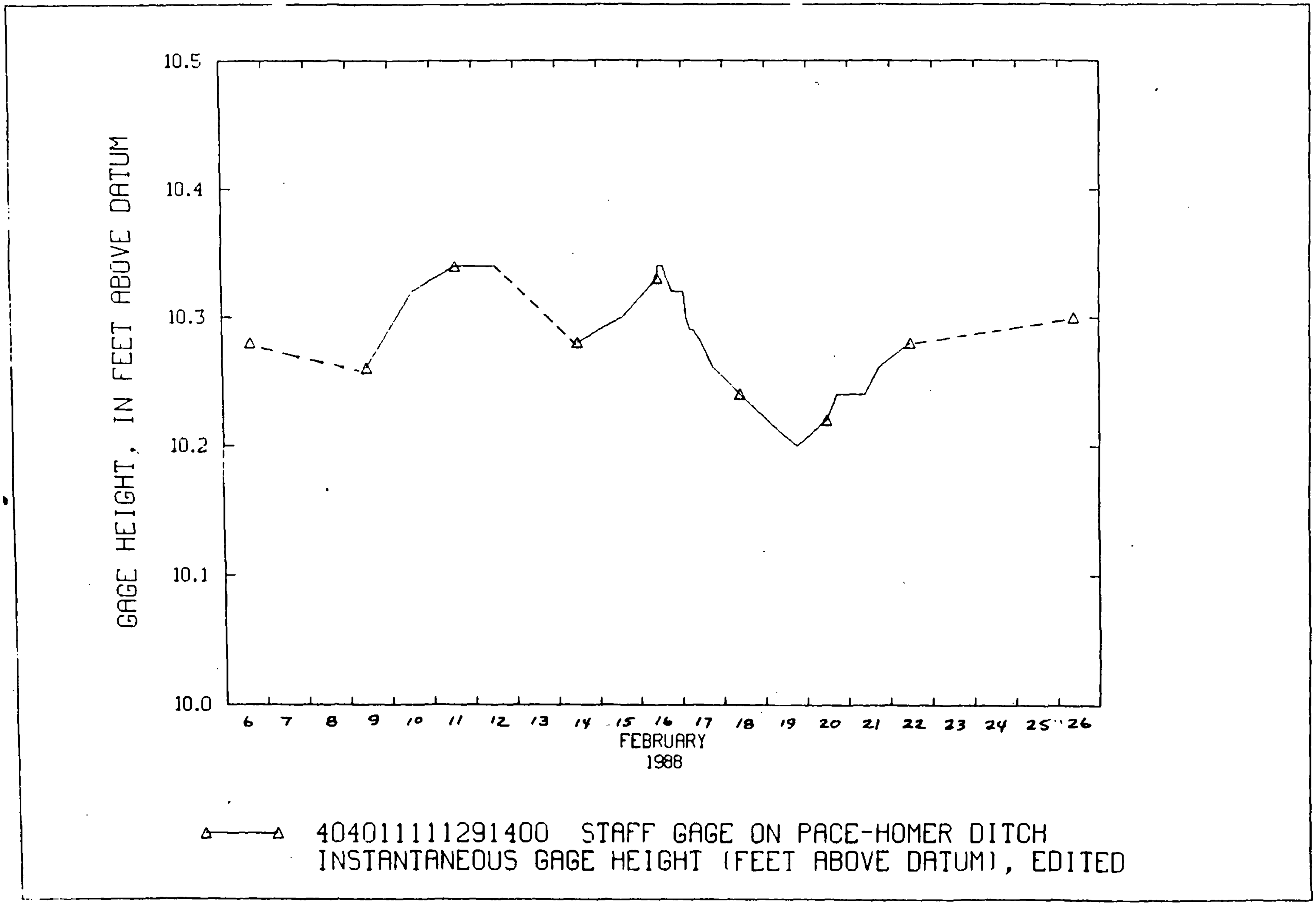



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

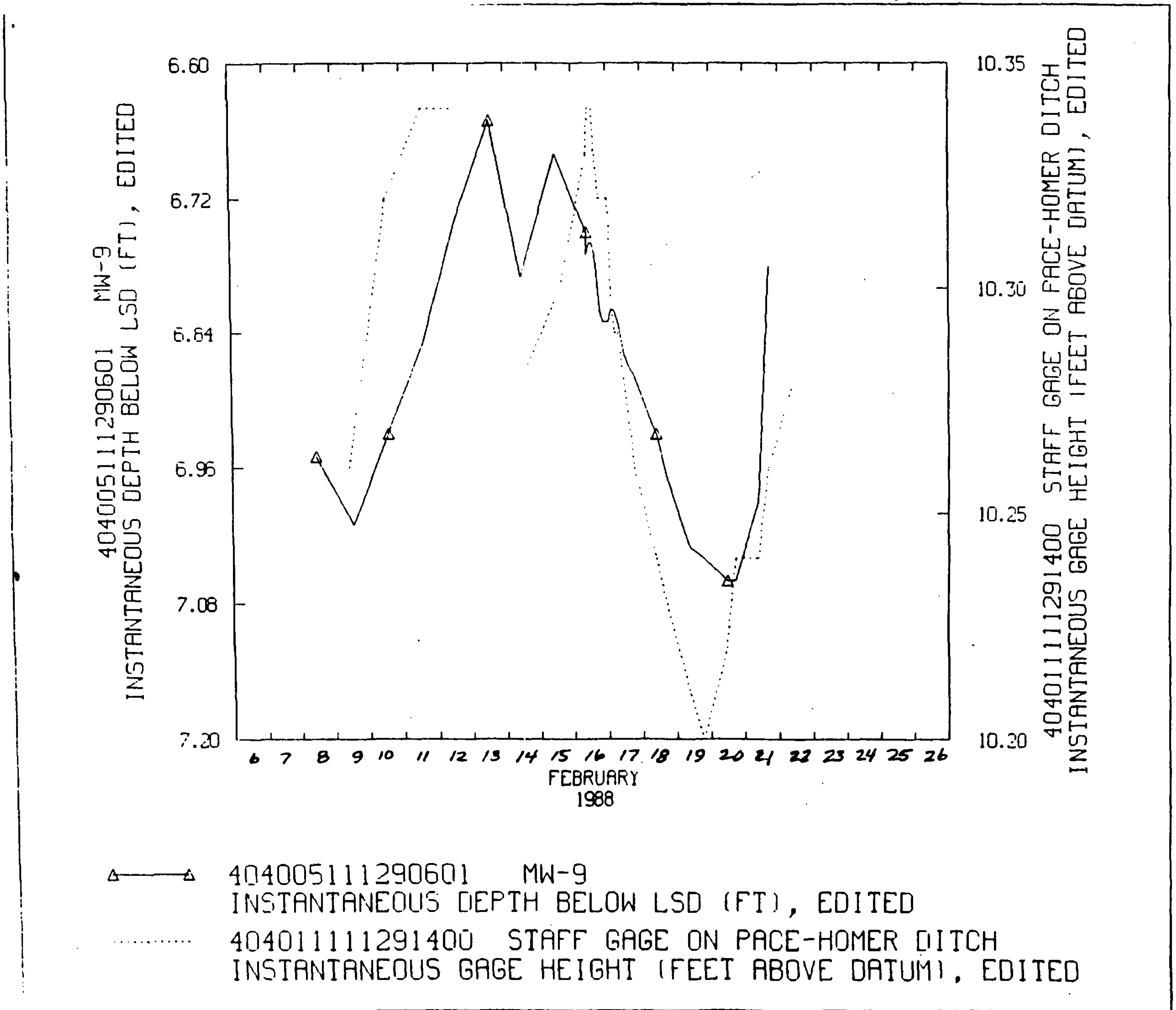



**Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.**

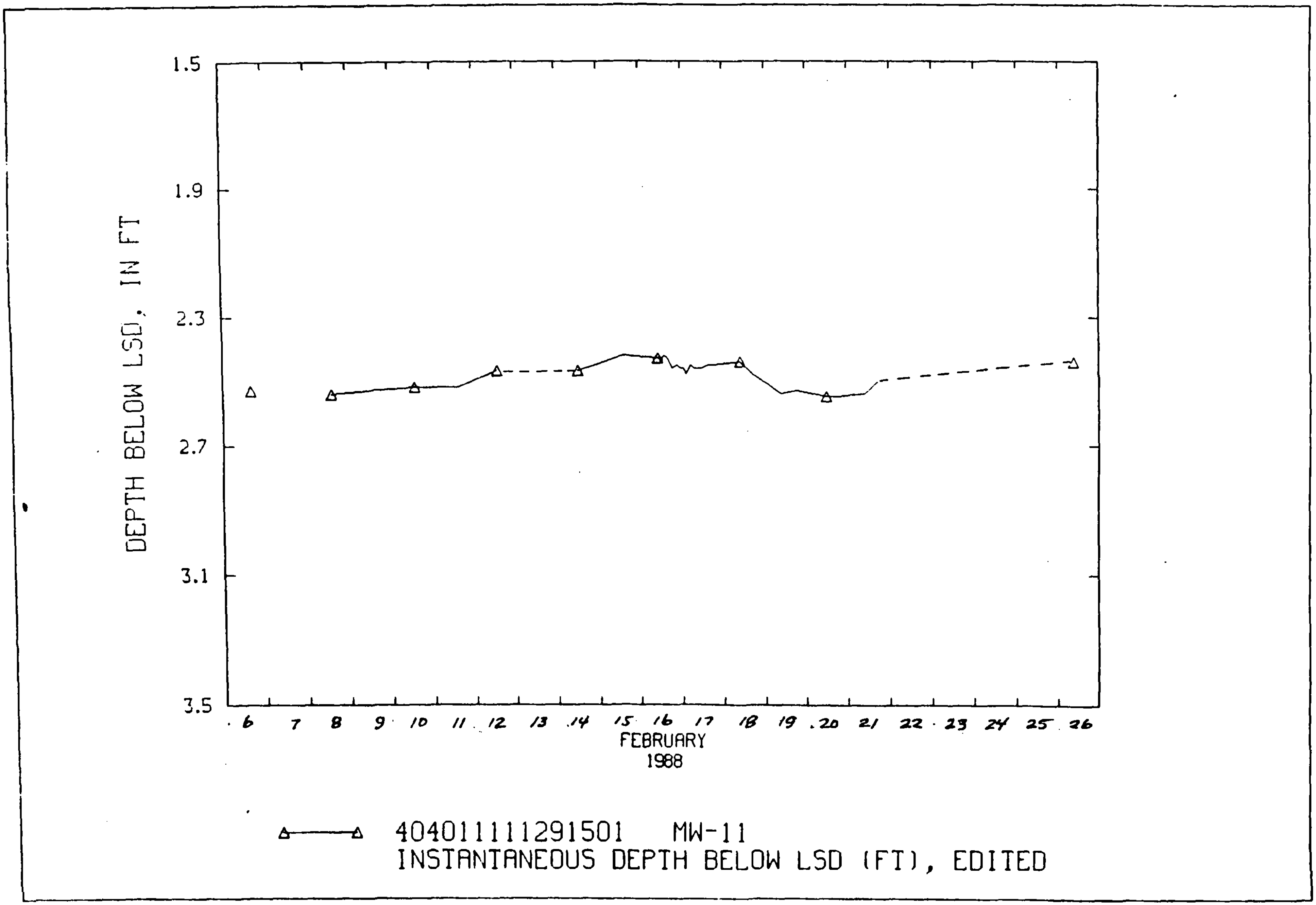



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

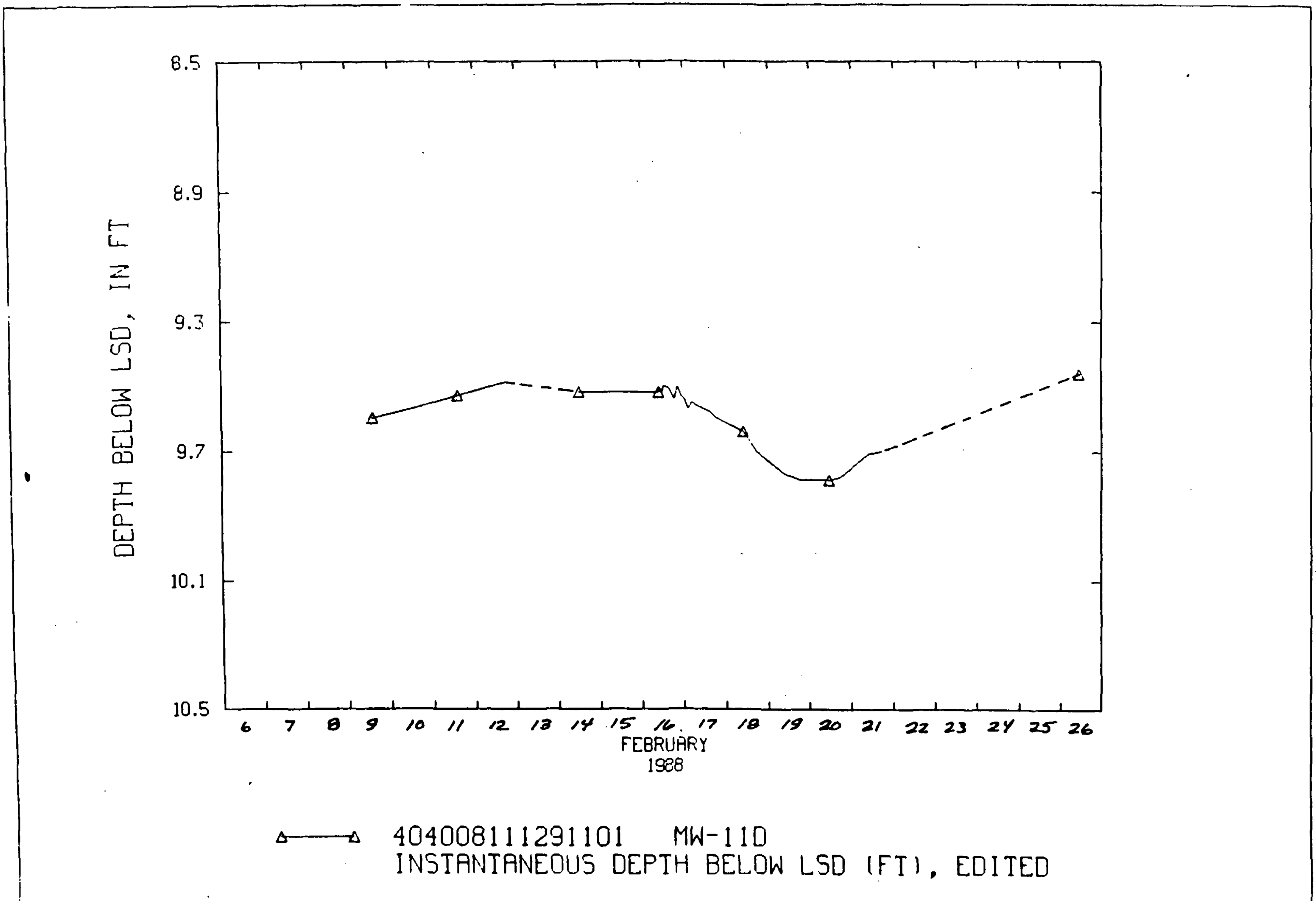



Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.

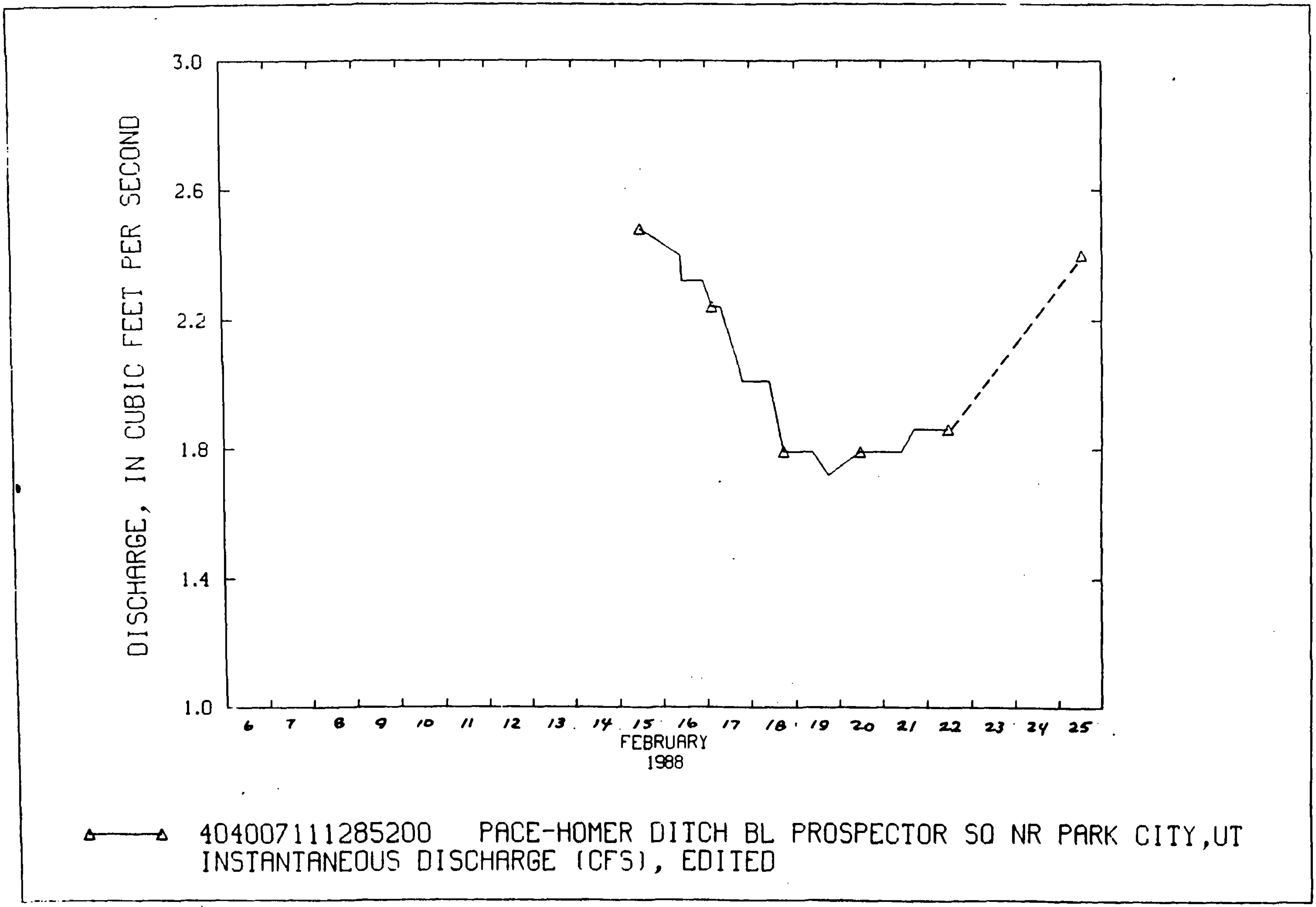



**Figure 6.--Fluctuations during interference test (dashed where estimated)--Continued.**

ATTACHMENT F

RESPONSE TO COMMENTS

DAMES & MOORE — PROFESSIONAL LIMITED PARTNERSHIP
250 EAST BROADWAY, SUITE 200, SALT LAKE CITY, UTAH 84111-2480 (801) 521-9255

August 23, 1988

Park City Municipal Corporation
P.O. Box 1480
Park City, Utah 84060-1299

Attention: Mr. Ron Ivie

Dear Ron:

Attached are comments relating to the "Draft Groundwater and Surface Water Study Report, Silver Creek Tailing Site" August 1988 prepared by the Utah Department of Health and the U.S. Geological Survey. Two sets of comments are attached reflecting the independent evaluations of George Condrat and myself.

Very truly yours,

DAMES & MOORE

Peter F. Olsen
Associate

PFO/fl

cc: Mr. Brent Bradford, UBSHW
Ms. Paula Schmittdiel, EPA

COMMENTS ON
DRAFT GROUNDWATER AND SURFACE WATER STUDY REPORT
SILVER CREEK TAILINGS SITE
AUGUST 1988

These comments deal exclusively with the water quality portion of the study. Overall, the report does a very poor job of presentation and analysis of the water quality data. It is extremely difficult to obtain an overview and make independent evaluations of the interpretations and conclusions reached. The map presented as Figure 2 is of such small scale and so crowded that it is very difficult to locate wells and surface water sampling points and correlate results with sites. The tailings area is not delineated on this map. The only map which provides reasonable locational data for the wells was hidden in an attachment and on it one of the upgradient wells is misidentified (2D should be 12).

The data is presented as a mass in Tables 6 and 7 for surface water sampling results and in a 5-page fine-print table (Table 9) for ground water. Such presentation defies visualization and understanding. Graphical presentations need to be included such as Piper diagrams for the common ions to show variations in basic water chemistry (by well and with time) and areal plots of the concentrations of key metals.

It is noted that "data which did not match closely with other labs was flagged with a star and was not included in the statistical evaluation." How was such a match determined - simply by subjective evaluation or was some objective criterion applied ? There are many sets of data included in Table 9 which are not flagged which do not "closely match" each other.

During submittal of quarterly results of EPA's CLP analyses, the data was in standard CLP format which indicates any qualifiers for each value presented. This format was not utilized in the report and as a result there is no way to determine if qualified data, including that which is bracketed, i.e., below CRDL, was used in making statistical comparisons. From previous submittals, however, it is obvious that it was.

Quality Assurance of the data is, in essence, not addressed. Presentation of the CLP results in standard format along with narrative indicating problem areas would be sufficient for EPA's analyses. Something similar is necessary for the USGS and State Health Laboratory data in order to permit evaluation of the precision and accuracy of these results. To simply state that both conduct their own QA programs and that such documents are kept on file and may be obtained upon request, provides no assurance of the quality of the data.

One specific QA area that needs to be discussed has to do with the detection limits for the various metals. These vary significantly among the three labs and within any one agency's lab(s) from round to round. Does the fact that EPA's splits were analyzed by "various contract laboratories" have anything to do with varying capabilities, different methodologies or varying CRDLs of the different labs ?

In making the calculations for statistical comparisons, how were values below reported detection limits handled - by utilizing half the reported detection limit as the value ?

While the use of the combined data from the three upgradient wells as "background" is appropriate, the use of the (presumably) combined data from "all other wells" as a downgradient value does not seem to be, since some of these "others," such as wells 2, 4, 5, 6 and 8 are in the middle of the site, not at its downgradient boundary.

Statistical evaluations were made separately for the data generated by each of the agencies. Whether this meets the intent of the Site Investigation Agreement which states that all validated (i.e., unqualified in our interpretation) be used is not clear and needs to be resolved. Since several CLP labs conducted the EPA analyses, another option may be to utilize the combined measurements of all three agency labs (eliminating outliers by an objective method).

Attachment D (still labeled as Appendix F) is taken directly out of the UBSHW regulations document. This is not an appropriate attachment since it deals with RCRA requirements, notes the 0.01 confidence level as per the Part 265 regulations, then in the formulas and tabular values uses t-values associated with the 0.05 confidence level. We assume that the 0.05 level was used but perhaps the 0.01 level is more appropriate in this situation. Since the Site Investigation Agreement does not specify the statistical test to be employed, justification for the use of Cochran's approximation of the Behrens-Fisher Students t-test needs to be presented. Simply because it is the one required in certain portions of the RCRA regulations does not mean that it is the most appropriate to use in this situation. This needs to be resolved among the participants in the Site Investigation Agreement.

The individual values (along with any qualifications of the data) used for each statistical comparison need to be clearly identified in a separate table and pertinent data for the comparison summarized. A presentation such as that in Table 11 does not provide sufficient information.

The concentrations of metals detected in the wells should be placed in better quantitative perspective to primary and secondary drinking water standards. For example, the highest levels of zinc detected (2,000-3,000 ug/l) are well below the secondary drinking water standard of 5,000 ug/l.

The term "release" is continually used in the water quality sections. This needs to be examined closely.

Comments by
Peter F. Olsen
Dames & Moore
August 22, 1988

COMMENTS ON
DRAFT GROUNDWATER AND SURFACE WATER STUDY REPORT
SILVER CREEK TAILINGS SITE
AUGUST 1988

SECTION 3.1

1st Paragraph

There is no evidence of glaciation of the valley at Prospector Square.

4th Paragraph

What information is available regarding the use of solvents and acids at the site?

5th Paragraph

To say Park City has plans to cover the tailings could be taken as a deliberate suggestion that the City has not acted at the site.

SECTION 3.4.1.2

The water table surface map in Figure 4 shows conditions only during April 1988. Were variations in the flow direction noted during other times of the year.

SECTION 3.4.1.4

2nd Paragraph

Infiltration of snow-melt and down-valley flow of ground water through the alluvium are an important cause of the ground water rise.

SECTION 3.4.1.5

How poor is the slug data ? Is it reliable at all ? The report should include the basic data and should show the curve matches.

SECTION 5.0

Is there aquifer interconnection between the alluvium under the Prospector Square site and Park Meadows well ? This was an important study objective.

SECTION 8.1

How was the volume of tailings calculated (to 4 significant figures) ? Apparently tailings were identified in only three borings (see Appendix A) with a total thickness of 1.0, 5.3 and 1.6 feet, respectively. What is assumed areal extent and thickness ? Concentrations of chromium and manganese are within the range typically encountered in western soils.

SECTION 8.2

2nd Paragraph

What is background ?

3rd Paragraph

What does significant mean ? This could be confused with statistically significant.

4th Paragraph

Well MW-10 is close to Silver Maple Claim and may be affected by that site. A more thorough evaluation of common ion chemistry may be more revealing than looking at trace metals. Sulfate is generally a good indicator of contamination from mineral deposits due to its generation by oxidation of sulfides. Report should contain Piper diagrams to aid evaluation of common ion chemistry. Concentration maps of sulfate, chloride and other constituents would also aid interpretation.

SECTION 8.3

Only zinc showed to be consistently above background in ground waters downgradient of the site according to the report. The occasional findings of significant increases for arsenic, cadmium, chromium, and manganese, are often contradicted by data for other agencies taken at the same time or by subsequent sampling rounds. Data for trace metals are subject to large variations due to sampling and analytical variability and the occasional significant differences may be due solely to this. Zinc and other parameters show wide variations between splits of individual samples.

Questions - How were "less than" values handled in statistical comparisons ? Have evaluations been made to statistically identify individual wells and sample splits which are outliers indicating sampling or analytical error ?

2nd Paragraph

"Another CERCLA site" - Is State suggesting Prospector Square is a CERCLA site ?

SECTION 8.4

Variations of up to 50 times occur within splits of individual samples.

SECTION 9.1

What is the meaning of "significant" in Item 2 ?

SECTION 9.2

Item 1 - See comment on Section 8.3

Item 2 - The average cadmium concentration of 0.018 mg/l was barely over the drinking water standard of 0.010 mg/l.

Item 3 - Does not say whether interconnection occurs.

SECTION 9.3

Item 1 - See comment in regard to Section 8.4

Item 2 - Cadmium exceeded the drinking water standard in one sample location (near Wyatt Earp Drive) in one sampling round only. Cadmium exceeded the standard in two of the three splits only, and only exceeded the standard by a small amount. The USGS split was over 5 times lower than the other splits values and was well below the standard. The stream location below the location near Wyatt Earp Drive met the standard for cadmium.

Tables 1 and 2 - An elevation of a clearly identifiable elevation datum (such as top of casing) should be reported for future monitoring. A surface elevation measure to 0.01 feet is very difficult to reconstruct unless there is a benchmark.

Well logs do not identify any tailings

Table 4 - Table should clearly identify what is being compared, should show population means and variances. Table should include evaluation of outliers, individual samples, and splits which are significantly different than the upgradient or downgradient populations.

Figures 1, 2, 4 and 6 - Should show north-arrows.

Figure 2 - Is difficult to read and at a rather small scale. Why not put it on a standard U.S.G.S. quadrangle map ?

Figure 5 - Should show months on x-axis and break between 1987 and 1988. Plots should be on sample vertical scales and same horizontal scales.

Figure 6 - What is this supposed to show ?

Comments by
George W. Condrat
Dames & Moore
August 22, 1988

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

SEP 1 1988

Ref: 8HWM-SR

Kent Gray
Utah Department of Health
P.O. Box 16690
Salt Lake City, Utah 84116-0690

Dear Kent:

Enclosed are EPA's comments regarding the draft Ground Water and Surface Water Study Report for the Silver Creek Tailings site. Although the report is fairly complete, several issues should be addressed before finalizing the report. If you or your staff have any questions regarding our comments, please feel free to contact me at (303) 293-1518.

I am planning on the meeting the morning of September 8th with the State and Park City to go over the comments to the report. Please let me know if plans for the meeting change.

Sincerely,

Paula Schmittdiel for

David A. Schaller, Chief
Site Evaluation Section

Enclosure

RECEIVED
SEP 6 1988

# EPA COMMENTS ON
# DRAFT GROUND WATER AND SURFACE WATER STUDY REPORT
# SILVER CREEK TAILINGS SITE

## GENERAL

1. The term "significant" is used throughout the report in a variety of contexts, some statistical and some not. Clarification is needed as to how the term is being used in the report, since the term has a specific meaning with reference to environmental impacts.

2. The report should include a detailed discussion of target populations for each pathway, including number of wells and their uses and zones of completion as well as surface water uses and points of diversion.

3. In several portions of the report, additional discussion is needed to explain what was done and how. The discussions in many instances are too general and do not allow the reader to reach the same conclusions. Specific examples of insuficient information and discussion are identified in the rest of the comments.

## GROUNDWATER

4. Section 3.4.1.5, Slug Test: The model that was used for analyzing the slug test as stated in the report is for confined isotropic conditions. In the first paragraph it stated that the alluvial aquifer is an anisotropic, unconfined aquifer. More explanation is needed as to why the methods used to determine hydraulic conductivities were considered appropriate when the assumptions of the methods can not be met. The Hrsorlev basic time lag method for approximating soil permeability is widely used for alluvial conditions that are heterogenous and unconfined in nature.

5. Section 5.0, Interfernce Test: Page 12, second paragraph, line 7 - the depth of 96 feet should be changed to 95 feet to match Table 1 in the well log for PS-MW-5D in Attachment A.

Page 13 - the statement that small fluctuations in wells PS-MW-1S, PS-MW-1D, PS-MW-2, PS-MW-3, PS-MW-4, PS-MW-7D and PS-MW-11D may have been due to pumping of the Park Meadows well does not appear to be substantiated by the hydrographs included in the report. The statement referring to the influence of the Park Meadows well and to recharge and surface runoff needs further explanation.

6. Section 8.2, Groundwater Data, Page 15, 2nd Paragraph: The discussion is unclear. Perhaps a sentence or phrase is missing.

7. More information is needed in Section 8.2 as to how upgradient and downgradient wells were determined. What method was used to determine an upgradient/downgradient well.

TAILINGS CHARACTERIZATION

8. Section 4.3.3,: No mention is made of the E.P. toxicity results of the subsurface soil cores collected of the tailings which indicate some of the samples meet the criteria of a hazardous waste. This information should be provided in the report and included in the findings. Also, a more detailed discussion should be included regarding the type of tailings and their extent found during drilling.

9. A discussion of the geochemical character of the tailings should be provided under section 8.1 on Waste Characterization, to help explain the results of the groundwater sampling effort. An understanding of the geo-chemical form of the tailings would support the presence or lack of particular elements in the groundwater.

SURFACE WATER

10. Section 8.4, Surface Water/Sediment Data: While Silver Creek sediment is heavily contaminated, the surface water release question still remains inconclusive, since the most upgradient sampling station is in the immediate vicinity of tailings. This was verified by the attempt to install a monitoring well at this location in November 1987. This effort encountered a significant thickness of tailings near the surface that have likely eroded into the creek as the sediment data shows. The furthest extent of contamination downstream is presently unknown.

11. Section 9.3, Surface Water: All comparisons in the report to background surface water or sediment are likely to underestimate releases. The conclusions should reflect this underestimate of releases to the surface water pathway.

DISCUSSION OF ANALYTICAL RESULTS

12. A more detailed discussion of the analytical results by well, parameter, and round is needed with comparisons of wells and rounds. Also, more extensive discussion of the statistical analyses conducted for the groundwater data should be provided, including why the Student T-test was selected and whether all the statistical assumptions were met with the data base. The discussion should also include the approach used to deal with outliers, etc.

13. More discussion is needed on the magnitude of the statistically significant releases that would help clarify the degree of metal releases from the tailings. An explanation as to

why well PS-MW-10 was not included in the statistical analyses is also needed.

14. An explanation as to why statistical analyses were not done on the surface water data should be given. Again, the discussion on the analytical results for the surface water and sediment samples is fairly general; more detail is needed.

QUALITY ASSURANCE

15. A more detailed discussion of the quality assurance procedures followed and the results of the quality assurance reviews for each set of data from each lab (EPA, USGS, and UDH) should be included in the report, i.e. spike recoveries, duplicates, blind samples, etc.

**DRAFT**
**FOR DISCUSSION ONLY**

Silver Creek Tailings Site
Groundwater/Surface Water Study Report

Response to Comments
By Peter F. Olsen

Page 1, first paragraph:

Enclosed will be a revised Figure 2 which shows sample locations more clearly. FIT has designated MW-12 as MW2D for their records.

Page 1 second paragraph:

Enclosed are the revised Tables 6,7 and 9.

Page 1, third paragraph:

The date were flagged by subjective evaluation. Most if not all data, which did not match closely, have been flagged.

Page 1, fourth paragraph:

All the qualified data are usuable unless rejected. Data from all rounds of sampling (with appropriate qualifiers) will be included in a separate attachment to the report.

Page 2, first paragraph:

The following steps were taken regarding the data quality assurance:

1. A detailed sampling plan (with input and consent from all parties) was prepared and followed during the field activities.

2. U.S. EPA Region VIII, Environmental Services Division conducted field audit and concluded that data gathered during this investigation should be valid and defensible.

3. Adequate number of field blanks, decomination blanks and duplicate samples were collected for each round of sampling. After the first round of groundwater sampling, performance evaluation (spike) samples were submitted to the labs with each set of samples. Analytical results of these quality control samples indicate that each lab's performance was adequate with the exception of cadmium results from the State Health Lab.

4. All CLP data were evaluated according to the EPA's functional guidelines for data validation and deemed acceptable. Data validation summaries will be included in an attachment to the report. State Health Lab is willing to

provide percision and accuracy data for each round of sampling. We will request USGS Lab to do the same. Percision and accuracy data will also be included in an attachment.

Page 2, second paragraph:

The detection limits depend upon various factors such as sample matrix, analytical method, lab proficiency and instrument used. Each analytical method has a range for detection limit and the CLP contract specifies required detection limit called (CRDL). These detection limits are above the instrument detection limit. The defference between the instrument detection limit and the method or contract detection limit provides opportunity for various labs to lower their reporting detection limit. This results in detection limits variability reported by different labs.

Page 2, third paragraph:

We intended to drop less than values from statistical calculations but due to the small sample size these values were used as such.

Page 2, fourth paragraph:

The wells which are hydraulically upgradient of the tailings area were designated as upgradient. The wells which are located on the tailings area can potentially be influenced by the tailings and were designated as the downgradient wells.

Page 2, last paragraph and page 3:

The criteria to determine a release under superfund process does not involve use of any statistics. It simply compares the downgradient contaminants levels against the upgradient ones. During the work plan negotiations references were made to RCRA requirements for statistical evaluation. This was the rationale for using the student t-test specified under RCRA.

Only validated date (which includes qualified data) was used. Each round of sampling was compared for each lab separately. Combining the results from different labs would increase the data variability.

The following data were not used in statistical evaluation:

1. Data collected from MW-10
2. Data collected from DR1 and DR2
3. Incomplete data set for a rounding a sampling (collected USGS occasionally)
4. Data flagged with a star (*).

DRAFT
FOR DISCUSSION ONLY

Response Comments
By George W. Condrat

Section 3.1, first paragraph:

If there is no evidence of glaciation of the valley, this word can be deleted.

Section 3.1, fourth paragraph:

We have documentation in our files that Pacific Bridge company reworked the tailings on-site using acids and solvents in 1940's.

Section 3.1, fifth paragraph:

Park City has covered most of the tailings. It is stated that Park City is planning to cover remaining exposed tailings area.

Sections 3.4.1.2, 3.4.1.4, 3.4.1.5:

Referred to USGS

Section 8.1

FIT calculated the volume of tailings based upon average thickness of tailings as five (5) feet in the 45 acres Prospector Square area.

Section 8.2, second paragraph:

Monitoring wells 1s, and 1d and 12 represent background wells for this site.

Section 8.2, third paragraph:

Significant means higher than background.

Section 8.2, fourth paragraph:

MW-10 is located downgradient of Prospector Square and is impacted by this site. Sulfate chloride and other anion provide useful information, the constituents of concern in this study are metals.

Section 8.3:

As stated earlier less than values were used as such in statistical evaluation. The date appear to match fairly well except for the data flagged as Star(*) and not used for statistical evaluation.

Section 8.3, second paragraph:

Yes, Prospector Square is a CERCLA site but not an NPL site.

DRAFT
FOR DISCUSSION ONLY

Section 8.4:

Data presented as provided by each lab.

Section 9.1:

Significant means higher than average soil values found in the Western U.S.

Section 9.2:

Item 1 - Response in Section 8.3.

Item 2 - No response is required.

Item 3 - Referred to USGS.

Section 9.3:

Item 1 - Response in Section 8.4.

Item 2 - Both filtered and unfiltered sample results should be reviewed in drawing conclusion.

Talbes 1, 2 and 4 - Referred to USGS.

Figures 1,2, 4, and 6 - Will show north arrows

Figure 2 and 5 - Referred to USGS.

Figure 6 - Shows site location on a USGS map.

MS/clq
BSHW/7169U/1-4

DRAFT
FOR DISCUSSION ONLY

Response Comments
By George W. Condrat

Section 3.1, first paragraph:

If there is no evidence of glaciation of the valley, this word can be deleted.

Section 3.1, fourth paragraph:

We have documentation in our files that Pacific Bridge company reworked the tailings on-site using acids and solvents in 1940's.

Section 3.1, fifth paragraph:

Park City has covered most of the tailings. It is stated that Park City is planning to cover remaining exposed tailings area.

Sections 3.4.1.2, 3.4.1.4, 3.4.1.5:

Referred to USGS

Section 8.1

FIT calculated the volume of tailings based upon average thickness of tailings as five (5) feet in the 45 acres Prospector Square area.

Section 8.2, second paragraph:

Monitoring wells 1s, and 1d and 12 represent background wells for this site.

Section 8.2, third paragraph:

Significant means higher than background.

Section 8.2, fourth paragraph:

MW-10 is located downgradient of Prospector Square and is impacted by this site. Sulfate chloride and other anion provide useful information, the constituents of concern in this study are metals.

Section 8.3:

As stated earlier less than values were used as such in statistical evaluation. The date appear to match fairly well except for the data flagged as Star(*) and not used for statistical evaluation.

Section 8.3, second paragraph:

Yes, Prospector Square is a CERCLA site but not an NPL site.

DRAFT
FOR DISCUSSION ONLY

Section 8.4:

Data presented as provided by each lab.

Section 9.1:

Significant means higher than average soil values found in the Western U.S.

Section 9.2:

Item 1 - Response in Section 8.3.

Item 2 - No response is required.

Item 3 - Referred to USGS.

Section 9.3:

Item 1 - Response in Section 8.4.

Item 2 - Both filtered and unfiltered sample results should be reviewed in drawing conclusion.

Talbes 1, 2 and 4 - Referred to USGS.

Figures 1,2, 4, and 6 - Will show north arrows

Figure 2 and 5 - Referred to USGS.

Figure 6 - Shows site location on a USGS map.

MS/clq
BSHW/7169U/1-4

RESPONSE TO COMMENTS
BY U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL:

1. `The term significant has been changed or deleted from the text of the report to avoid confusion.

2. Discussion of target population for surface and groundwater pathways has been added to the report.

3. Additional discussion and clarification has been added to the report where applicable.

GROUNDWATER:

4. The slug test data were analyzed using methods described by Bouwer and (1976) and Cooper and others (1967). The solution described by Bouwer and Rice (1976), which was developed for unconfined condition is based on the assumption that the aquifer is isotropic, the solution omits storage in the aquifer, and treats the water table as a fixed, constant-head boundary, The solution described by Cooper and others (1967) is based on the assumption that aquifer is confined, isotropic and not leaky.

   The conditions to which above models are applicable exist in the study area.

5. Interference Test: The suggested correction has been made in the text.

   Page 13 - there are insufficient data to identify specific causes and offer further explanation.

6. Text has been revised to clarify the discussion.

7. Monitoring wells (1S, 1D and 12) which are hydraulically upgradient from the site are designated as upgradient wells. All other wells which are on-site and can be impacted from the tailings are designated as downgradient wells.

TAILINGS CHARACTERIZATION:

8. E.P. Toxicily analyses were not done as part of the approved work plan. These analyses were conducted to determine the proper disposal drilling/mud-cuttings. However, E.P. Toxicity analysis is included in attachment G.

9. It is nor clear what is meant by this comment.

SURFACE WATER:

10. During the drilling of monitoring well at this location very little tailings were encountered. This was confined by Jim Mason of U.S. Geological Survey. It is difficult to establish a background location in an area where tailings are ubiquitously present.

11. Same response as states above in #10.

DISCUSSION OF ANALYTICAL RESULTS:

12. A discussion of analytical results for each round is provided. However, it is difficult to discuss each monitoring well separately. Analytical results for each well are included in Table 9. Rationale for selection of T-test has been added to the report.

13. MW-10 was not included in the statistical analysis because it is located on Silver Maples Claim property (another CERCLA site).

14. Statictical analysis was not done on the surface water results due to insufficient data. The sample size is too small for statisical evaluation.

QUALITY ASSURANCE:

15. Discussion on quality assurance has now been included in the report.

MS/clq
7339U-1 thru 2

ATTACHMENT G

E. P. TOXICITY DATA

TABLE 1

TAILINGS CHARACTERIZATION SAMPLES
SUBSURFACE SOILS (ug/l)
EP TOXICITY LEACHING TEST
PROSPECTOR SQUARE
PARK CITY, UTAH

| SAMPLE NUMBER | PS-MW-3 | PS-MW-4 | PS-MW-5 | PS-MW-5 | PS-MW-5 | PS-MW-5 |
|---|---|---|---|---|---|---|
| TRAFFIC NUMBER | MHH-057 | MHH-058 | MHH-053 | MHH-054 | MHH-055 | MHH-056 |
| SAMPLE INTERVAL | 1.0-2.0' | 1.0-1.5' | 1.0-1.5' | 4.0-5.5' | 5.5-7.0' | 7.5-9.0' |
| Aluminum | [87]j | [56]j | [66]nj | [196]j | [89]j | [103]j |
| Antimony | 34uj | 34uj | 34uj | 34uj | 34uj | 34uj |
| Arsenic | 10uj | 1.2uj | 10uj | 10uj | 10uj | 10uj |
| Barium | [22] | 360 | [138] | [61] | [82] | [21] |
| Beryllium | 1.5uj | 1.5uj | 1.5u | 1.5uj | 1.5uj | 1.5uj |
| Cadmium | 583j | 29j | 675j | 675j | 608j | 1070j |
| Calcium | 32,900 | 388,000 | 165,000 | 150,000 | 184,000 | 25,900 |
| Chromium | 3.1uj | 3.1uj | 3.1uj | 3.1uj | 3.1uj | 3.1uj |
| Cobalt | 6.8u | 6.8u | 6.8u | 6.8u | 6.8u | 6.8u |
| Copper | 327 | 2.1u | 179j | 158j | 100j | 324j |
| Iron | 17uj | 17uj | 17uj | [92]j | 17uj | 17uj |
| Lead | 5640 | 51j | 2370 | 2170j | 1790j | 1890j |
| Magnesium | [1920] | 7400 | [2870] | [2280] | [2850] | [1960] |
| Manganese | 2410j | 292j | 2510j | 2240j | 2530j | 2550j |
| Mercury | 0.2uj | 0.2uj | 0.2u | 0.2uj | 0.2uj | 0.2uj |
| Nickel | 24u | 24u | 24u | 24u | 24u | 24u |
| Potassium | [2020] | [2380]j | [1740]j | [1800]j | [2090]j | [1440]j |
| Selenium | 5.0uj | 2.0uj | [3.0]j | 2.0j | 2.0uj | 2.0uj |
| Silver | [6.3]j | 2.2uj | [8.6]j | [8.1]j | [6.0]j | [9.5]j |
| Sodium | [769] | [3600]j | [322]j | [295] | [414]j | [311]j |
| Thallium | [4.8]r | 10r | 2.1r | 2.1r | 2.1r | 2.1r |
| Vanadium | [13] | [12] | [7.7] | [6.6] | [6.6] | [11] |
| Zinc | 85,900r | 1160 | 63,400 | 61,800 | 504,000 | 84,500 |

[] - indicated concentation detected at less than contract required detection limits.
u - indicates - undetected at this concentration
uj - detection limit estimated because not all quality control criteria were met
j - estimated value; not all quality control criteria were met
r - rejected data

TABLE 1

TAILINGS CHARACTERIZATION SAMPLES
SUBSURFACE SOILS
EP TOXICITY LEACHING TEST (ug/l)
PROSPECTOR SQUARE
PARK CITY, UTAH

| SAMPLE NUMBER<br>TRAFFIC NUMBER<br>SAMPLE INTERVAL | PS-MW-9<br>MHH-059<br>3.0-4.0' | PS-MW-9<br>MHH-060<br>1.5-2.0' | PS-MW-9<br>MHH-061<br>2.4-3.0' | EP TOXI-<br>CITY<br>STANDARD | EPA HAZ-<br>ARDOUS<br>NUMBER |
|---|---|---|---|---|---|
| Aluminum | [53]j | [27]uj | [99]j | | |
| Antimony | [39]j | [34]uj | 34uj | | |
| Arsenic | 10uj | 1.2uj | 10uj | 5000 | D0004 |
| Barium | [161] | [69] | [83] | 100,000 | D0005 |
| Beryllium | 1.5uj | 1.5uj | 1.5uj | | |
| Cadmium | 277j | 834j | 643 | 1000 | D0006 |
| Calcium | 204,000 | 410,000 | 167,000 | | |
| Chromium | 3.1uj | 3.1uj | 3.1uj | 5000 | D0008 |
| Cobalt | 6.8u | 6.8u | [14] | | |
| Copper | 232j | 78j | 230j | | |
| Iron | 17uj | 17uj | 17uj | | |
| Lead | 590j | 1970j | 1760j | 5000 | |
| Magnesium | [2770] | 6240 | [4460] | | |
| Manganese | 4450j | 3100j | 6500j | | |
| Mercury | 0.2uj | 0.7j | 0.2uj | 200 | D0009 |
| Nickel | 24u | 24u | 24u | | |
| Potassium | [538]j | 180uj | [712]j | | |
| Selenium | 2.0uj | 5.0uj | 2.0uj | 1000 | D0010 |
| Silver | 2.2uj | 2.2uj | [2.4]uj | 5000 | D0011 |
| Sodium | [1900] | [1220]j | [1090] | | |
| Thallium | 10r | 10r | 2.1r | | |
| Vanadium | [4.9] | 2.9u | [3.6] | | |
| Zinc | 14100 | 52,100r | 44,000 | | |

[] - indicated concentation detected at less than contract required detection limits.
u - indicates - undetected at this concentration
uj - detection limit estimated because not all quality control criteria were met
j - estimated value; not all quality control criteria were met
r - rejected data

TABLE 2
EP TOXICITY ANALYTICAL RESULTS, (ug/l)
SUBSURFACE BOREHOLE SAMPLES
PROSPECTOR SQUARE
PARK CITY, UT
CASE #3317H

| SAMPLE NUMBER<br>DEPTH<br>TRAFFIC NUMBER | BH-01<br>3.5′-4.0′<br>MHH-092 | BH-01<br>4.0′-5.5′<br>MHH-093 | BH-02<br>0.0′-2.0′<br>MHH-091 | BH-02<br>2.0′-4.0′<br>MHH-094 | BH-02<br>4.0′-5.0′<br>MHH-095 |
|---|---|---|---|---|---|
| Aluminum | 78u | 78u | 78u | 78u | 78u |
| Antimony | 50u | 50u | 50u | 50u | 96 |
| Arsenic | 10u | 10u | 10u | 10u | 10u |
| Barium | [108] | [164] | [27] | 23u | 23u |
| Beryllium | 2u | 2u | 2u | 2u | 2u |
| Cadmium | 251 | 178 | 792 | 904 | 1090 |
| Calcium | 19100 | 29600 | 661000 | 655000j | 674000j |
| Chromium | 22 | 9u | 9u | 9u | 9u |
| Cobalt | 20u | 20u | [20] | 20u | 20u |
| Copper | 9u | 9u | 53 | 221 | 578 |
| Iron | 113 | 43u | [43] | 43u | 43u |
| Lead | 5.82j | 154j | 2910j | 2540j | 2440j |
| Magnesium | [1970] | [3730] | [3360] | 11300 | 7050 |
| Manganese | 169j | 379j | 3990j | 5900 | 7330 |
| Mercury | 0.2u | 0.2u | 1.3 | 2.5j | 0.2j |
| Nickel | 25u | 25u | 25u | 68j | 25u |
| Potassium | [4550] | [4370] | [1210] | [1050] | [1170] |
| Selenium | 5u | 5u | 5u | 5u | 25u |
| Silver | 8u | 8u | 8u | 8u | 8u |
| Sodium | [4390] | [3820] | [2010] | 7190 | 7390 |
| Thallium | 10u | 10u | 10u | 10u | 10u |
| Tin | 38u | 38u | 38u | 38u | 38u |
| Vanadium | 11u | 11u | 11u | 11u | 11u |
| Zinc | 12900 | 10100 | 96500 | 102000 | 108000 |

[] - indicated concentation detected at less than contract required detection limits.
u - indicates - undetected at this concentration
uj - detection limit estimated because not all quality control criteria were met
j - estimated value; not all quality control criteria were met
r - rejected data

TABLE 3
(SOLUBILITY CONSTANTS) PREDICTED ZINC
CONCENTRATIONS (ug/l) VERSUS pH

| log Kg | $Zn^{2+}$ 11.2 | $ZnOH^{+}$ 2.2 | $ZnCO_3$ 7.95[3] |
|---|---|---|---|
| pH 5.5 | 130,000 | 205,550 | 10,183 |
| pH 6.5 | 10,980 | 72,172 | 315 |
| pH 7.0 | 2,740 | 42,766 | 45 |

PARK CITY MW-1D
BUREAU OF SOLID AND HAZAR
DOUS WASTE

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY MW-1D | | | | |
| Site ID: | CW87123 | Source: 00 | | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704589 | Type: 40 | | Date of Review and QA Validation | |
| Sample Date: | 87/08/03 | Time: 12:35 | | Inorganic Review: | 87/10/27 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/10/27 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 47.0 | ppm | T-Barium | 110.0 | ppm |
| T-Cadmium | 6 | ppm | T-Chromium | 100.0 | ppm |
| T-Copper | 35.0 | ppm | T-Iron | 24000.0 | ppm |
| T-Lead | 110.0 | ppm | T-Manganes | 880.0 | ppm |
| Mercury | 0.089 | ppm | T-Selenium | <30.0 | ppm |
| T-Silver | <6.0 | ppm | T-Zinc | 160.0 | ppm |
| Arsenic HW | NO | ppm | Barium HW | NO | ppm |
| Cadmium HW | NO | ppm | Cr (HW) | NO | ppm |
| Lead (HW) | NO | ppm | Mercury HW | NO | ppm |
| Se (HW) | NO | ppm | Silver HW | NO | ppm |
| % Solids | 81.3 | | | | |

Approved by: J. Oman

PROSPECTOR SQUARE
M.SLAM BUREAU OF SOLID
AND HAZARDOUS WASTE

E.P. TOXICITY
+
T.M.

MW-1

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report TAILINGS

Description: PROSPECTOR SQUARE
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704125 Type: 50
Sample Date: 87/07/16 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 6.0 ppm | T-Barium | 34.0 ppm |
| T-Cadmium | 13 ppm | T-Chromium | 50.0 ppm |
| T-Lead | 110.0 ppm | T-Manganes | 500.0 ppm |
| Mercury | <1.0 ppm | T-Silver | 1.3 ppm |
| T-Zinc | 250.0 ppm | Arsenic HW | <0.2 ppm |
| Barium HW | 0.093 ppm | Cadmium HW | <0.05 ppm |
| Cr (HW) | <0.03 ppm | Lead (HW) | <0.2 ppm |
| Mercury HW | <0 ppm | Se (HW) | <0.2 ppm |
| Silver HW | 0.01 ppm | % Solids | 94.0 |

Approved by: J. Oman

PARK CITY MW-1
M.SLAM BUREAU OF SOLID
AND HAZARDOUS WASTE

E.P. TOXICITY
+
T.M.

MW-1
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-1
Site ID: CW87160 Source: 00
Cost Code: 365
Lab Number: 8704099 Type: 40
Sample Date: 87/07/15 Time: 14:30
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 13.0 ppm | T-Barium | 480.0 ppm |
| T-Cadmium | 21 ppm | T-Chromium | 115.0 ppm |
| T-Lead | 170.0 ppm | T-Manganes | 4800.0 ppm |
| Mercury | <2.0 ppm | T-Silver | 5.0 ppm |
| T-Zinc | 310.0 ppm | Arsenic HW | <0.2 ppm |
| Barium HW | 0.57 ppm | Cadmium HW | <0.05 ppm |
| Cr (HW) | <0.03 ppm | Lead (HW) | <0.2 ppm |
| Mercury HW | <0 ppm | Se (HW) | <0.2 ppm |
| Silver HW | <0.01 ppm | %SOLIDS | 8.2 |

Approved by: J. Orman

RECEIVED
JUL 20 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

PROSPECTOR SQUARE MW-1
M.SALM BUREAU OF SOLID
AND HAZARDOUS WASTE

MW-1
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PROSPECTOR SQUARE MW-1 | | | | |
| Site ID: | | Source: | 00 | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704124 | Type: | 50 | Date of Review and QA Validation | |
| Sample Date: | 87/07/16 | Time: | | Inorganic Review: | 87/07/17 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/07/17 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | * | ** | | * | ** |
|---|---|---|---|---|---|
| T-Arsenic | <10.0 ppm | (<.2) | T-Barium | 100.0 ppm | (2.2) |
| T-Cadmium | 17 ppm | (.36) | T-Chromium | 73.0 ppm | (1.5) |
| T-Lead | 77.0 ppm | (1.6) | T-Manganes | 980.0 ppm | (2.06) |
| Mercury | <1.0 ppm | (<.1) | T-Silver | 2.0 ppm | (.04) |
| T-Zinc | 170.0 ppm | (3.6) | % Solids | 83.3 | |

Approved by: J. Oman ± 25%

* DRY WEIGHT BASIS
** AS RECEIVED BASIS

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-1D

MW-1D
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY PS-SO-1D | | | | |
| Site ID: | | Source: | 00 | | |
| Cost Code: | 900 | | | | |
| Lab Number: | 8704608 | Type: | 50 | Date of Review and QA Validation | |
| Sample Date: | 87/07/21 | Time: | 14:50 | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 60.0 ppm | T-Barium | 160.0 ppm |
| T-Cadmium | 7 ppm | T-Chromium | 60.0 ppm |
| T-Copper | 50.0 ppm | T-Iron | 21000.0 ppm |
| T-Lead | 220.0 ppm | T-Manganes | 640.0 ppm |
| Mercury | 0.2 ppm | T-Selenium | <40.0 ppm |
| T-Silver | <7.0 ppm | T-Zinc | 460.0 ppm |
| % Solids | 71.4 | | |

Rough
Estimate

8704589

| | | |
|---|---|---|
| T-AS | 47.000 | T-Arsenic, ug/l |
| T-BA | 110.00 | T-Barium, mg/l |
| T-CD | 6.000 | T-Cadmium, ug/l |
| T-CR | 100.00 | T-Chromium, ug/l |
| T-CU | 35.000 | T-Copper, ug/l |
| T-FE | 24000. | T-Iron, mg/l |
| T-PB | 110.00 | T-Lead, ug/l |
| T-MN | 880.00 | T-Manganese, ug/l |
| HG | .089 | Mercury, ug/l |
| T-SE | <30.000 | T-Selenium, ug/l |
| T-AG | < 6.000 | T-Silver, ug/l |
| T-ZN | 160.00 | T-Zinc, ug/l |
| ASHW | | Arsenic (HW), ppm |
| BAHW | | Barium (HW), ppm |
| CDHW | | Cadmium (HW), ppm |
| CRHW | | Chromium (HW), ppm |
| PBHW | | Lead (HW), ppm |
| HGHW | | Mercury (HW), ppm |
| SEHW | | Selenium (HW), ppm |
| AGHW | | Silver (HW), ppm |
| | 81.300 | % Solids |

MW1D TAILINGS

RECEIVED
SEP 01 1987
Bureau of Solid
& Hazardous Waste

CW87123
MWD

Rough
Estimate

J. Oman

SILVER CREEK PS MW3 1'-2'
SOLID AND HAZARDOUS WASTE

MW-3
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK PS MW3 1'-2'
Site ID: CW87213 Source: 00
Cost Code: 365
Lab Number: 8704423 Type: 50
Sample Date: 87/07/28 Time: 08:41
Tot. Cations:
Tot. Anions: me/1 Cations:
Grand Total: me/1 Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 380.0 ppm | T-Barium | 210.0 ppm |
| T-Cadmium | 190 ppm | T-Chromium | 57.0 ppm |
| T-Copper | 710.0 ppm | T-Iron | 22000.0 ppm |
| T-Lead | 13000.0 ppm | T-Manganes | 2000.0 ppm |
| Mercury | 3.7 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 67.0 ppm | T-Zinc | 23000.0 ppm |
| % Solids | | | |

Approved by:

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

SILVER CREEK PS MW3 1'-2'
SOLID AND HAZARDOUS WASTE

MW-3
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK PS MW3 1'-2'
Site ID: CW87213 Source: 00
Cost Code: 365
Lab Number: 8704423 Type: 50
Sample Date: 87/07/28 Time: 08:41
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 380.0 ppm | T-Barium | 210.0 ppm |
| T-Cadmium | 190 ppm | T-Chromium | 57.0 ppm |
| T-Copper | 710.0 ppm | T-Iron | 22000.0 ppm |
| T-Lead | 13000.0 ppm | T-Manganes | 2000.0 ppm |
| Mercury | 3.7 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 67.0 ppm | T-Zinc | 23000.0 ppm |
| % Solids | 91.7 | | |

Approved by: J. Oman

Rough Estimate

PARK CITY MW-3
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICITY
+
T.M. MW-3
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-3
Site ID: CW87120 Source: 00
Cost Code: 365
Lab Number: 8704586 Type: 40
Sample Date: 87/07/29 Time: 12:30
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | <180.0 | ppm | T-Barium | 260.0 | ppm |
| T-Cadmium | <40 | ppm | T-Chromium | 110.0 | ppm |
| T-Copper | 37.0 | ppm | T-Iron | 31000.0 | ppm |
| T-Lead | 150.0 | ppm | T-Manganes | 810.0 | ppm |
| Mercury | 0.1 | ppm | T-Selenium | <180.0 | ppm |
| T-Silver | <40.0 | ppm | T-Zinc | 410.0 | ppm |
| Arsenic HW | <0.2 | ppm | Barium HW | 0.36 | ppm |
| Cadmium HW | <0.05 | ppm | Cr (HW) | <0.03 | ppm |
| Lead (HW) | <0.2 | ppm | Mercury HW | <0 | ppm |
| Se (HW) | <0.2 | ppm | Silver HW | <0.01 | ppm |
| % Solids | 6.0 | | | | |

Approved by: J. Oman

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-3A

MW-3
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY PS-SO-3A
Site ID: Source: 00
Cost Code: 900
Lab Number: 8704610 Type: 50
Sample Date: 87/07/23 Time: 13:40
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 120.0 ppm | T-Barium | 76.0 ppm |
| T-Cadmium | 30 ppm | T-Chromium | 40.0 ppm |
| T-Copper | 160.0 ppm | T-Iron | 25000.0 ppm |
| T-Lead | 4800.0 ppm | T-Manganes | 1000.0 ppm |
| Mercury | 3.2 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 10.0 ppm | T-Zinc | 5400.0 ppm |
| % Solids | 82.3 | | |

Rough
Estimate

RECEIVED

SEP 14 1987

Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW-4
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-4
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW-4
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704246 Type: 50
Sample Date: 87/07/18 Time: 10:15
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | <45.0 ppm | T-Barium | 110.0 ppm |
| T-Cadmium | <5 ppm | T-Chromium | 27.0 ppm |
| T-Copper | 35.0 ppm | T-Iron | 17000.0 ppm |
| T-Lead | 97.0 ppm | T-Manganes | 280.0 ppm |
| Mercury | 0.02 ppm | T-Selenium | <45.0 ppm |
| T-Silver | <9.0 ppm | T-Zinc | 150.0 ppm |
| % Solids | 94.0 | | |

Approved by: J. Cman

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-4A

MW-4
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | |
|---|---|---|---|
| Description: | PARK CITY PS-SO-4A | | |
| Site ID: | | Source: | 00 |
| Cost Code: | 900 | | |
| Lab Number: | 8704609 | Type: | 50 |
| Sample Date: | 87/07/23 | Time: | 17:15 |
| Tot. Cations: | | | |
| Tot. Anions: | | me/l Cations: | |
| Grand Total: | | me/l Anions: | |

Date of Review and QA Validation

| | |
|---|---|
| Inorganic Review: | 87/08/31 |
| Organic Review: | |
| Radiochemistry Review: | 87/08/31 |
| Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 320.0 ppm | T-Barium | 160.0 ppm |
| T-Cadmium | 67 ppm | T-Chromium | 87.0 ppm |
| T-Copper | 510.0 ppm | T-Iron | 25000.0 ppm |
| T-Lead | 5600.0 ppm | T-Manganes | 2800.0 ppm |
| Mercury | 4.1 ppm | T-Selenium | <25.0 ppm |
| T-Silver | 40.0 ppm | T-Zinc | 12000.0 ppm |
| % Solids | 96.7 | | |

Rough
Estimate

RECEIVED

SEP 14 1987

Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW-5 1-1.5
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-5
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW-5 1-1.5
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704247 Type: 50
Sample Date: 87/07/20 Time: 11:40
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 410.0 | ppm | T-Barium | 94.0 | ppm |
| T-Cadmium | 83 | ppm | T-Chromium | 36.0 | ppm |
| T-Copper | 680.0 | ppm | T-Iron | 20000.0 | ppm |
| T-Lead | 6800.0 | ppm | T-Manganes | 2100.0 | ppm |
| Mercury | 4.5 | ppm | T-Selenium | <26.0 | ppm |
| T-Silver | 52.0 | ppm | T-Zinc | 16000.0 | ppm |
| % Solids | 95.2 | | | | |

Approved by: J. Crean

RECEIVED
SEP 14 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW5 4-5
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-5 (4-5 FT)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW5 4-5
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704248 Type: 50
Sample Date: 87/07/20 Time: 11:50
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 480.0 ppm | T-Barium | 57.0 ppm |
| T-Cadmium | 88 ppm | T-Chromium | 31.0 ppm |
| T-Copper | 570.0 ppm | T-Iron | 17000.0 ppm |
| T-Lead | 9300.0 ppm | T-Manganes | 2400.0 ppm |
| Mercury | 4.3 ppm | T-Selenium | <26.0 ppm |
| T-Silver | 57.0 ppm | T-Zinc | 17000.0 ppm |
| % Solids | 91.6 | | |

Approved by: J Cinan

RECEIVED
SEP 14 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW 5-5--7-5
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-5 (5-7.5 FT)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW 5-5--7-5
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704249 Type: 50
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 380.0 ppm | T-Barium | 59.0 ppm |
| T-Cadmium | 92 ppm | T-Chromium | 32.0 ppm |
| T-Copper | 540.0 ppm | T-Iron | 22000.0 ppm |
| T-Lead | 7000.0 ppm | T-Manganes | 1900.0 ppm |
| Mercury | 2.3 ppm | T-Selenium | <27.0 ppm |
| T-Silver | 59.0 ppm | T-Zinc | 15000.0 ppm |
| % Solids | 91.8 | | |

Approved by: J. Cman

RECEIVED

SEP 14 1987

Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW5 7-9
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-5 (7-9FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW5 7-9
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704250 Type: 50
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 400.0 ppm | T-Barium | 120.0 ppm |
| T-Cadmium | 82 ppm | T-Chromium | 33.0 ppm |
| T-Copper | 660.0 ppm | T-Iron | 16000.0 ppm |
| T-Lead | 7700.0 ppm | T-Manganes | 2100.0 ppm |
| Mercury | 3.8 ppm | T-Selenium | <27.0 ppm |
| T-Silver | 55.0 ppm | T-Zinc | 15000.0 ppm |
| % Solids | 91.0 | | |

Approved by: J. Ovan

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-5A

MW-5
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | |
|---|---|---|---|---|
| Description: | PARK CITY PS-SO-5A | | | |
| Site ID: | | Source: 00 | | |
| Cost Code: | 900 | | | |
| Lab Number: | 8704612 | Type: 50 | Date of Review and QA Validation | |
| Sample Date: | 87/07/24 | Time: 14:50 | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 210.0 ppm | T-Barium | 75.0 ppm |
| T-Cadmium | 40 ppm | T-Chromium | 33.0 ppm |
| T-Copper | 420.0 ppm | T-Iron | 23000.0 ppm |
| T-Lead | 4400.0 ppm | T-Manganes | 1300.0 ppm |
| Mercury | 5.1 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 27.0 ppm | T-Zinc | 7000.0 ppm |
| % Solids | 84.7 | | |

Rough
Estimate

PARK CITY PS-MW-6
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICITY
+
T.M.

MW-6
~~Ø~~ LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | |
|---|---|---|---|---|
| Description: | PARK CITY PS-MW-6 | | | |
| Site ID: | | Source: | 00 | |
| Cost Code: | 365 | | | |
| Lab Number: | 8704290 | Type: | 40 | Date of Review and QA Validation |
| Sample Date: | 87/07/20 | Time: | | Inorganic Review: |
| Tot. Cations: | | | | Organic Review: |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: |
| Grand Total: | | me/l Anions: | | Microbiology Review: |

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 50.0 | ppm | T-Barium | 540.0 | ppm |
| T-Cadmium | 20 | ppm | T-Chromium | 110.0 | ppm |
| T-Copper | 61.0 | ppm | T-Iron | 32000.0 | ppm |
| T-Lead | 480.0 | ppm | T-Manganes | 1500.0 | ppm |
| Mercury | 4.0 | ppm | T-Selenium | <50.0 | ppm |
| T-Zinc | 1500.0 | ppm | Arsenic HW | <0.2 | ppm |
| Barium HW | 0.34 | ppm | Cadmium HW | 0.06 | ppm |
| Cr (HW) | <0.03 | ppm | Lead (HW) | <0.2 | ppm |
| Mercury HW | <0 | ppm | Se (HW) | <0.2 | ppm |
| Silver HW | <0.01 | ppm | % Solids | 14.1 | |

Approved by: J. Oman

PARK CITY PS-MW-7
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICITY
+
T.M

MW-7
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY PS-MW-7
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704288 Type: 40
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | <100.0 ppm | T-Barium | 920.0 ppm |
| T-Cadmium | 42 ppm | T-Chromium | 190.0 ppm |
| T-Copper | 210.0 ppm | T-Iron | 46000.0 ppm |
| T-Lead | 1900.0 ppm | T-Manganes | 1700.0 ppm |
| Mercury | 12.0 ppm | T-Selenium | <100.0 ppm |
| T-Zinc | 2900.0 ppm | Arsenic HW | <0.2 ppm |
| Barium HW | 0.22 ppm | Cadmium HW | 0.08 ppm |
| Cr (HW) | <0.03 ppm | Lead (HW) | 0.25 ppm |
| Mercury HW | 0.002 ppm | Se (HW) | <0.2 ppm |
| Silver HW | <0.01 ppm | % Solids | 5.9 |

Approved by: J. Oman

PARK CITY PS-MW-7
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E. P. TOXICTY
+
T. M.

MW-7
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY PS-MW-7
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704289 Type: 40
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 130.0 | ppm | T-Barium | 800.0 | ppm |
| T-Cadmium | 32 | ppm | T-Chromium | 160.0 | ppm |
| T-Copper | 260.0 | ppm | T-Iron | 40000.0 | ppm |
| T-Lead | 2600.0 | ppm | T-Manganes | 1600.0 | ppm |
| Mercury | 6.6 | ppm | T-Selenium | <80.0 | ppm |
| T-Zinc | 3700.0 | ppm | Arsenic HW | <0.2 | ppm |
| Barium HW | 0.27 | ppm | Cadmium HW | 0.12 | ppm |
| Cr (HW) | <0.03 | ppm | Lead (HW) | 0.48 | ppm |
| Mercury HW | 0.007 | ppm | Se (HW) | <0.2 | ppm |
| Silver HW | <0.01 | ppm | % Solids | 16.6 | |

Approved by: J. Oman

RECEIVED

SEP 0 1 1987

Bureau of Solid
& Hazardous Waste

PARK CITY MW-8
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-8
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY MW-8 | | | | |
| Site ID: | CW87121 | Source: | 00 | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704587 | Type: | 40 | Date of Review and QA Validation | |
| Sample Date: | 87/07/30 | Time: | | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 49.0 ppm | T-Barium | 180.0 ppm |
| T-Cadmium | 7 ppm | T-Chromium | 70.0 ppm |
| T-Copper | 28.0 ppm | T-Iron | 23000.0 ppm |
| T-Lead | 120.0 ppm | T-Manganes | 920.0 ppm |
| Mercury | 1.1 ppm | T-Selenium | <40.0 ppm |
| T-Silver | <7.0 ppm | T-Zinc | 470.0 ppm |
| % Solids | 28.2 | | |

Approved by: J. Oman

Rough Estimate

PARK CITY MW-8
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICITY
+
T.M.

MW-8
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-8
Site ID: CW87124 Source: 00
Cost Code: 365
Lab Number: 8704583 Type: 40
Sample Date: 87/07/30 Time: 09:00
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 70.0 | ppm | T-Barium | 90.0 | ppm |
| T-Cadmium | 16 | ppm | T-Chromium | 110.0 | ppm |
| T-Copper | 60.0 | ppm | T-Iron | 21000.0 | ppm |
| T-Lead | 470.0 | ppm | T-Manganes | 920.0 | ppm |
| Mercury | 0.7 | ppm | T-Selenium | <30.0 | ppm |
| T-Silver | <6.0 | ppm | T-Zinc | 1800.0 | ppm |
| Arsenic HW | <0.2 | ppm | Barium HW | 0.23 | ppm |
| Cadmium HW | 0.15 | ppm | Cr (HW) | <0.03 | ppm |
| Lead (HW) | <0.2 | ppm | Mercury HW | <0 | ppm |
| Se (HW) | <0.2 | ppm | Silver HW | <0.01 | ppm |
| % Solids | 83.6 | | | | |

Approved by: J. Oman

RECEIVED

SEP 0 1 1987

Bureau of Solid
& Hazardous Waste

PARK CITY/SILVER CREEK PS MW 9 1-5'-2'
SOLID AND HAZARDOUS WASTE

MW-9 (1.5-2 FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY/SILVER CREEK PS MW 9 1-5'-2'
Site ID: CW87211 Source: 00
Cost Code: 365
Lab Number: 8704421 Type: 50
Sample Date: 87/07/28 Time: 12:15
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 460.0 | ppm | T-Barium | 14.0 | ppm |
| T-Cadmium | 220 | ppm | T-Chromium | 35.0 | ppm |
| T-Copper | 490.0 | ppm | T-Iron | >72000.0 | ppm |
| T-Lead | 8500.0 | ppm | T-Manganes | 2000.0 | ppm |
| Mercury | 0.8 | ppm | T-Selenium | 60.0 | ppm |
| T-Silver | 59.0 | ppm | T-Zinc | 31000.0 | ppm |
| % Solids | 90.0 | | | | |

Approved by: J. Oman

Rough estimate

RECEIVED

SEP 0 1 1987

Bureau of Solid
& Hazardous Waste

PARK CITY/SILVER CREEK PS MW9 3'-3.5'
SOLID AND HAZARDOUS WASTE

MW-9 (3-3.5 FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY/SILVER CREEK PS MW9 3'-3.5'
Site ID: CW87212 Source: 00
Cost Code: 365
Lab Number: 8704422 Type: 50
Sample Date: 87/07/28 Time: 12:30
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 430.0 | ppm | T-Barium | 66.0 | ppm |
| T-Cadmium | 77 | ppm | T-Chromium | 33.0 | ppm |
| T-Copper | 630.0 | ppm | T-Iron | 34000.0 | ppm |
| T-Lead | 8300.0 | ppm | T-Manganes | 1900.0 | ppm |
| Mercury | 4.5 | ppm | T-Selenium | <30.0 | ppm |
| T-Silver | 50.0 | ppm | T-Zinc | 13000.0 | ppm |
| % Solids | 86.0 | | | | |

Approved by: J. Oman

Rough Estimate

RECEIVED

SEP 0 1 1987

Bureau of Solid
& Hazardous Waste

PARK CITY SILVER CREEK PS MW9-29-30
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-9 (29-30 FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK PS MW9-29-30
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704420 Type: 50
Sample Date: 87/07/28 Time: 12:20
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 530.0 ppm | T-Barium | 18.0 ppm |
| T-Cadmium | 130 ppm | T-Chromium | 29.0 ppm |
| T-Copper | 730.0 ppm | T-Iron | >76000.0 ppm |
| T-Lead | 9400.0 ppm | T-Manganes | 1800.0 ppm |
| Mercury | 3.0 ppm | T-Selenium | 60.0 ppm |
| T-Silver | 53.0 ppm | T-Zinc | 19000.0 ppm |
| % Solids | 83.4 | | |

Approved by: J. Oman

Rough Estimate

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY MW-10 2-4
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-10 (2-4 FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY MW-10 2-4 | | | | |
| Site ID: | CW87126 | Source: | 00 | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704585 | Type: | 40 | Date of Review and QA Validation | |
| Sample Date: | 87/07/31 | Time: | 09:55 | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 370.0 ppm | T-Barium | 56.0 ppm |
| T-Cadmium | 56 ppm | T-Chromium | 19.0 ppm |
| T-Copper | 620.0 ppm | T-Iron | 11000.0 ppm |
| T-Lead | 8700.0 ppm | T-Manganes | 1800.0 ppm |
| Mercury | 4.9 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 56.0 ppm | T-Zinc | 12000.0 ppm |
| % Solids | 83.0 | | |

Approved by: J. Oman

Rough Estimate

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY MW-10
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-10
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-10
Site ID: CW87122 Source: 00
Cost Code: 365
Lab Number: 8704588 Type: 40
Sample Date: 87/07/31 Time: 09:00
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 830.0 | ppm | T-Barium | 250.0 | ppm |
| T-Cadmium | <85 | ppm | T-Chromium | <85.0 | ppm |
| T-Copper | 1100.0 | ppm | T-Iron | 36000.0 | ppm |
| T-Lead | 12000.0 | ppm | T-Manganes | 1800.0 | ppm |
| Mercury | 18.0 | ppm | T-Selenium | <420.0 | ppm |
| T-Silver | 80.0 | ppm | T-Zinc | 14000.0 | ppm |
| % Solids | 2.8 | | | | |

Approved by: J. Oman
Rough Estimate

RECEIVED

SEP 14 1987

Utah Dept of Health
Bureau of Solid & Hazardous Waste

PARK CITY MW-10 1-2
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-10 (1-2 FT)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY MW-10 1-2 | | | | |
| Site ID: | CW87125 | Source: | 00 | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704584 | Type: | 40 | Date of Review and QA Validation | |
| Sample Date: | 87/07/31 | Time: | 09:49 | Inorganic Review: | 87/09/01 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/09/01 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 210.0 ppm | T-Barium | 32.0 ppm |
| T-Cadmium | 63 ppm | T-Chromium | 32.0 ppm |
| T-Copper | 360.0 ppm | T-Iron | 20000.0 ppm |
| T-Lead | 4800.0 ppm | T-Manganes | 1900.0 ppm |
| Mercury | 3.7 ppm | T-Selenium | <32.0 ppm |
| T-Silver | 32.0 ppm | T-Zinc | 11000.0 ppm |
| % Solids | 91.0 | | |

Approved by: J. Cman

CUTTINGS/H2O SAMPLES FROM DRILLING

RECEIVED
OCT 02 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

PARK CITY SILVER CREEK/PROSPECTOR SQUARE MW-12
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-12 (TAILINGS) = 2D

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK/PROSPECTOR SQUARE MW-12 = 2D
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704876 Type: 40
Sample Date: 87/08/14 Time: 16:00
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/30
Organic Review:
Radiochemistry Review: 87/09/30
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 51.0 ppm | T-Barium | 72.0 ppm |
| T-Cadmium | 7.2 ppm | T-Chromium | 33.0 ppm |
| T-Copper | 22.0 ppm | T-Iron | 20000.0 ppm |
| T-Lead | 72.0 ppm | T-Manganes | 720.0 ppm |
| Mercury | 0.04 ppm | T-Selenium | <12.0 ppm |
| T-Silver | <0.6 ppm | T-Zinc | 190.0 ppm |
| Arsenic HW | <0.5 ppm | Barium HW | 0.15 ppm |
| Cadmium HW | <0.13 ppm | Cr (HW) | <0.08 ppm |
| Lead (HW) | <0.5 ppm | Mercury HW | <0 ppm |
| Se (HW) | <0.5 ppm | Silver HW | <0.03 ppm |
| % Solids | 82.9 | | |

Approved by: J. Oman

PARK CITY SILVER CREEK/PROSPECTOR SQUARE MW-12
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-12(CUTTINGS) = 2D - LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK/PROSPECTOR SQUARE MW-12 = 2D
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704875 Type: 40
Sample Date: 87/08/14 Time: 16:00
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/30
Organic Review:
Radiochemistry Review: 87/09/30
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 130.0 | ppm | T-Barium | 230.0 | ppm |
| T-Cadmium | <23 | ppm | T-Chromium | 98.0 | ppm |
| T-Copper | 54.0 | ppm | T-Iron | 37000.0 | ppm |
| T-Lead | 360.0 | ppm | T-Manganes | 1600.0 | ppm |
| Mercury | 0.58 | ppm | T-Selenium | <90.0 | ppm |
| T-Silver | <5.0 | ppm | T-Zinc | 490.0 | ppm |
| Arsenic HW | <0.5 | ppm | Barium HW | 0.75 | ppm |
| Cadmium HW | <0.13 | ppm | Cr (HW) | <0.08 | ppm |
| Lead (HW) | <0.5 | ppm | Mercury HW | <0 | ppm |
| Se (HW) | <0.5 | ppm | Silver HW | <0.03 | ppm |
| % SOLIDS | 3.8 | | | | |

Approved by: J. Oman

PARK CITY SILVER CREEK / PROSPECTOR SQUARE
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-12 = 2D TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK / PROSPECTOR SQUARE
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704874 Type: 40
Sample Date: 87/08/13 Time: 11:28
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/30
Organic Review:
Radiochemistry Review: 87/09/30
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 34.0 ppm | T-Barium | 54.0 ppm |
| T-Cadmium | 5.3 ppm | T-Chromium | 37.0 ppm |
| T-Copper | 21.0 ppm | T-Iron | 13000.0 ppm |
| T-Lead | 97.0 ppm | T-Manganes | 260.0 ppm |
| Mercury | 0.04 ppm | T-Selenium | <12.0 ppm |
| T-Silver | 1.7 ppm | T-Zinc | 160.0 ppm |
| Arsenic HW | <0.5 ppm | Barium HW | 0.25 ppm |
| Cadmium HW | <0.12 ppm | Cr (HW) | <0.08 ppm |
| Lead (HW) | <0.5 ppm | Mercury HW | <0 ppm |
| Se (HW) | <0.5 ppm | Silver HW | <0.03 ppm |
| % Solids | 82.2 | | |

Approved by: J. Oman

RECEIVED
OCT 02 87
Utah Dept. of ...
Bureau of Solid & Hazard ...

PARK CITY SILVER CREEK/PROSPECTOR SQUARE
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-12 =2D LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK/PROSPECTOR SQUARE
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704873 Type: 40
Sample Date: 87/08/13 Time: 11:40
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/30
Organic Review:
Radiochemistry Review: 87/09/30
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 140.0 | ppm | T-Barium | 300.0 | ppm |
| T-Cadmium | <35 | ppm | T-Chromium | 84.0 | ppm |
| T-Copper | 34.0 | ppm | T-Iron | 31000.0 | ppm |
| T-Lead | 150.0 | ppm | T-Manganes | 300.0 | ppm |
| Mercury | 0.1 | ppm | T-Selenium | <140.0 | ppm |
| T-Silver | <7.0 | ppm | T-Zinc | 320.0 | ppm |
| Arsenic HW | <0.5 | ppm | Barium HW | 0.95 | ppm |
| Cadmium HW | <0.13 | ppm | Cr (HW) | <0.08 | ppm |
| Lead (HW) | <0.5 | ppm | Mercury HW | <0 | ppm |
| Se (HW) | <0.5 | ppm | Silver HW | <0.03 | ppm |
| % SOLIDS | 3.0 | | | | |

Approved by: J. Oman

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-LARSON

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY PS-SO-LARSON | | | | |
| Site ID: | | Source: 00 | | | |
| Cost Code: | 900 | | | | |
| Lab Number: | 8704611 | Type: 50 | | Date of Review and QA Validation | |
| Sample Date: | 87/07/24 | Time: 17:55 | | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 150.0 ppm | T-Barium | 150.0 ppm |
| T-Cadmium | 30 ppm | T-Chromium | 210.0 ppm |
| T-Copper | 280.0 ppm | T-Iron | 37000.0 ppm |
| T-Lead | 2900.0 ppm | T-Manganes | 2800.0 ppm |
| Mercury | 2.5 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 20.0 ppm | T-Zinc | 4000.0 ppm |
| % Solids | 95.7 | | |

Rough
Estimate

TABLE 1

TAILINGS CHARACTERIZATION SAMPLES
SUBSURFACE SOILS (ug/l)
EP TOXICITY LEACHING TEST
PROSPECTOR SQUARE
PARK CITY, UTAH

| SAMPLE NUMBER | PS-MW-3 | PS-MW-4 | PS-MW-5 | PS-MW-5 | PS-MW-5 | PS-MW-5 |
|---|---|---|---|---|---|---|
| TRAFFIC NUMBER | MHH-057 | MHH-058 | MHH-053 | MHH-054 | MHH-055 | MHH-056 |
| SAMPLE INTERVAL | 1.0-2.0' | 1.0-1.5' | 1.0-1.5' | 4.0-5.5' | 5.5-7.0' | 7.5-9.0' |
| Aluminum | [87]j | [56]j | [66]nj | [196]j | [89]j | [103]j |
| Antimony | 34uj | 34uj | 34uj | 34uj | 34uj | 34uj |
| Arsenic | 10uj | 1.2uj | 10uj | 10uj | 10uj | 10uj |
| Barium | [22] | 360 | [138] | [61] | [82] | [21] |
| Beryllium | 1.5uj | 1.5uj | 1.5u | 1.5uj | 1.5uj | 1.5uj |
| Cadmium | 583j | 29j | 675j | 675j | 608j | 1070j |
| Calcium | 32,900 | 388,000 | 165,000 | 150,000 | 184,000 | 25,900 |
| Chromium | 3.1uj | 3.1uj | 3.1uj | 3.1uj | 3.1uj | 3.1uj |
| Cobalt | 6.8u | 6.8u | 6.8u | 6.8u | 6.8u | 6.8u |
| Copper | 327 | 2.1u | 179j | 158j | 100j | 324j |
| Iron | 17uj | 17uj | 17uj | [92]j | 17uj | 17uj |
| Lead | 5640 | 51j | 2370 | 2170j | 1790j | 1890j |
| Magnesium | [1920] | 7400 | [2870] | [2280] | [2850] | [1960] |
| Manganese | 2410j | 292j | 2510j | 2240j | 2530j | 2550j |
| Mercury | 0.2uj | 0.2uj | 0.2u | 0.2uj | 0.2uj | 0.2uj |
| Nickel | 24u | 24u | 24u | 24u | 24u | 24u |
| Potassium | [2020] | [2380]j | [1740]j | [1800]j | [2090]j | [1440]j |
| Selenium | 5.0uj | 2.0uj | [3.0]j | 2.0j | 2.0uj | 2.0uj |
| Silver | [6.3]j | 2.2uj | [8.6]j | [8.1]j | [6.0]j | [9.5]j |
| Sodium | [769] | [3600]j | [322]j | [295] | [414]j | [311]j |
| Thallium | [4.8]r | 10r | 2.1r | 2.1r | 2.1r | 2.1r |
| Vanadium | [13] | [12] | [7.7] | [6.6] | [6.6] | [11] |
| Zinc | 85,900r | 1160 | 63,400 | 61,800 | 504,000 | 84,500 |

[] - indicated concentation detected at less than contract required detection limits.
u - indicates - undetected at this concentration
uj - detection limit estimated because not all quality control criteria were met
j - estimated value; not all quality control criteria were met
r - rejected data

TABLE 1

TAILINGS CHARACTERIZATION SAMPLES
SUBSURFACE SOILS
EP TOXICITY LEACHING TEST (ug/l)
PROSPECTOR SQUARE
PARK CITY, UTAH

| SAMPLE NUMBER<br>TRAFFIC NUMBER<br>SAMPLE INTERVAL | PS-MW-9<br>MHH-059<br>3.0-4.0' | PS-MW-9<br>MHH-060<br>1.5-2.0' | PS-MW-9<br>MHH-061<br>2.4-3.0' | EP TOXI-<br>CITY<br>STANDARD | EPA HAZ-<br>ARDOUS<br>NUMBER |
|---|---|---|---|---|---|
| Aluminum | [53]j | [27]uj | [99]j | | |
| Antimony | [39]j | [34]uj | 34uj | | |
| Arsenic | 10uj | 1.2uj | 10uj | 5000 | D0004 |
| Barium | [161] | [69] | [83] | 100,000 | D0005 |
| Beryllium | 1.5uj | 1.5uj | 1.5uj | | |
| Cadmium | 277j | 834j | 643 | 1000 | D0006 |
| Calcium | 204,000 | 410,000 | 167,000 | | |
| Chromium | 3.1uj | 3.1uj | 3.1uj | 5000 | D0008 |
| Cobalt | 6.8u | 6.8u | [14] | | |
| Copper | 232j | 78j | 230j | | |
| Iron | 17uj | 17uj | 17uj | | |
| Lead | 590j | 1970j | 1760j | 5000 | |
| Magnesium | [2770] | 6240 | [4460] | | |
| Manganese | 4450j | 3100j | 6500j | | |
| Mercury | 0.2uj | 0.7j | 0.2uj | 200 | D0009 |
| Nickel | 24u | 24u | 24u | | |
| Potassium | [538]j | 180uj | [712]j | | |
| Selenium | 2.0uj | 5.0uj | 2.0uj | 1000 | D0010 |
| Silver | 2.2uj | 2.2uj | [2.4]uj | 5000 | D0011 |
| Sodium | [1900] | [1220]j | [1090] | | |
| Thallium | 10r | 10r | 2.1r | | |
| Vanadium | [4.9] | 2.9u | [3.6] | | |
| Zinc | 14100 | 52,100r | 44,000 | | |

[] - indicated concentation detected at less than contract required detection limits.

u - indicates - undetected at this concentration

uj - detection limit estimated because not all quality control criteria were met

j - estimated value; not all quality control criteria were met

r - rejected data

TABLE 2
EP TOXICITY ANALYTICAL RESULTS, (ug/l)
SUBSURFACE BOREHOLE SAMPLES
PROSPECTOR SQUARE
PARK CITY, UT
CASE #3317H

| SAMPLE NUMBER<br>DEPTH<br>TRAFFIC NUMBER | BH-01<br>3.5'-4.0'<br>MHH-092 | BH-01<br>4.0'-5.5'<br>MHH-093 | BH-02<br>0.0'-2.0'<br>MHH-091 | BH-02<br>2.0'-4.0'<br>MHH-094 | BH-02<br>4.0'-5.0'<br>MHH-095 |
|---|---|---|---|---|---|
| Aluminum | 78u | 78u | 78u | 78u | 78u |
| Antimony | 50u | 50u | 50u | 50u | 96 |
| Arsenic | 10u | 10u | 10u | 10u | 10u |
| Barium | [108] | [164] | [27] | 23u | 23u |
| Beryllium | 2u | 2u | 2u | 2u | 2u |
| Cadmium | 251 | 178 | 792 | 904 | 1090 |
| Calcium | 19100 | 29600 | 661000 | 655000j | 674000j |
| Chromium | 22 | 9u | 9u | 9u | 9u |
| Cobalt | 20u | 20u | [20] | 20u | 20u |
| Copper | 9u | 9u | 53 | 221 | 578 |
| Iron | 113 | 43u | [43] | 43u | 43u |
| Lead | 5.82j | 154j | 2910j | 2540j | 2440j |
| Magnesium | [1970] | [3730] | [3360] | 11300 | 7050 |
| Manganese | 169j | 379j | 3990j | 5900 | 7330 |
| Mercury | 0.2u | 0.2u | 1.3 | 2.5j | 0.2j |
| Nickel | 25u | 25u | 25u | 68j | 25u |
| Potassium | [4550] | [4370] | [1210] | [1050] | [1170] |
| Selenium | 5u | 5u | 5u | 5u | 25u |
| Silver | 8u | 8u | 8u | 8u | 8u |
| Sodium | [4390] | [3820] | [2010] | 7190 | 7390 |
| Thallium | 10u | 10u | 10u | 10u | 10u |
| Tin | 38u | 38u | 38u | 38u | 38u |
| Vanadium | 11u | 11u | 11u | 11u | 11u |
| Zinc | 12900 | 10100 | 96500 | 102000 | 108000 |

[] - indicated concentation detected at less than contract required detection limits.
u - indicates - undetected at this concentration
uj - detection limit estimated because not all quality control criteria were met
j - estimated value; not all quality control criteria were met
r - rejected data

TABLE 3
(SOLUBILITY CONSTANTS) PREDICTED ZINC
CONCENTRATIONS (ug/l) VERSUS pH

| | $Zn^{2+}$ | $ZnOH^+$ | $ZnCO_3$ |
|---|---|---|---|
| log Kg | 11.2 | 2.2 | 7.95 |
| pH 5.5 | 130,000 | 205,550 | 10,183 |
| pH 6.5 | 10,980 | 72,172 | 315 |
| pH 7.0 | 2,740 | 42,766 | 45 |

PARK CITY MW-1D
BUREAU OF SOLID AND HAZAR
DOUS WASTE

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY MW-1D | | | | |
| Site ID: | CW87123 | Source: 00 | | | |
| Cost Code: | 365 | | | Date of Review and QA Validation | |
| Lab Number: | 8704589 | Type: 40 | | | |
| Sample Date: | 87/08/03 | Time: 12:35 | | Inorganic Review: | 87/10/27 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/10/27 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 47.0 ppm | T-Barium | 110.0 ppm |
| T-Cadmium | 6 ppm | T-Chromium | 100.0 ppm |
| T-Copper | 35.0 ppm | T-Iron | 24000.0 ppm |
| T-Lead | 110.0 ppm | T-Manganes | 880.0 ppm |
| Mercury | 0.089 ppm | T-Selenium | <30.0 ppm |
| T-Silver | <6.0 ppm | T-Zinc | 160.0 ppm |
| Arsenic HW | NO ppm | Barium HW | NO ppm |
| Cadmium HW | NO ppm | Cr (HW) | NO ppm |
| Lead (HW) | NO ppm | Mercury HW | NO ppm |
| Se (HW) | NO ppm | Silver HW | NO ppm |
| % Solids | 81.3 | | |

Approved by: J Oman

PROSPECTOR SQUARE
M.SLAM BUREAU OF SOLID
AND HAZARDOUS WASTE

E. P. TOXICITY
+
T. M.

MW-1
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PROSPECTOR SQUARE
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704125 Type: 50
Sample Date: 87/07/16 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 6.0 | ppm | T-Barium | 34.0 | ppm |
| T-Cadmium | 13 | ppm | T-Chromium | 50.0 | ppm |
| T-Lead | 110.0 | ppm | T-Manganes | 500.0 | ppm |
| Mercury | <1.0 | ppm | T-Silver | 1.3 | ppm |
| T-Zinc | 250.0 | ppm | Arsenic HW | <0.2 | ppm |
| Barium HW | 0.093 | ppm | Cadmium HW | <0.05 | ppm |
| Cr (HW) | <0.03 | ppm | Lead (HW) | <0.2 | ppm |
| Mercury HW | <0 | ppm | Se (HW) | <0.2 | ppm |
| Silver HW | 0.01 | ppm | % Solids | 94.0 | |

Approved by: J. Oman

PARK CITY MW-1
M.SLAM BUREAU OF SOLID
AND HAZARDOUS WASTE

E.P. TOXICITY
+
T.M.

MW-1
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-1
Site ID: CW87160 Source: 00
Cost Code: 365
Lab Number: 8704099 Type: 40
Sample Date: 87/07/15 Time: 14:30
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 13.0 ppm | T-Barium | 480.0 ppm |
| T-Cadmium | 21 ppm | T-Chromium | 115.0 ppm |
| T-Lead | 170.0 ppm | T-Manganes | 4800.0 ppm |
| Mercury | <2.0 ppm | T-Silver | 5.0 ppm |
| T-Zinc | 310.0 ppm | Arsenic HW | <0.2 ppm |
| Barium HW | 0.57 ppm | Cadmium HW | <0.05 ppm |
| Cr (HW) | <0.03 ppm | Lead (HW) | <0.2 ppm |
| Mercury HW | <0 ppm | Se (HW) | <0.2 ppm |
| Silver HW | <0.01 ppm | %SOLIDS | 8.2 |

Approved by: J. Orman

RECEIVED

JUL 20 1987

Utah Dept. of Health
Bureau of Solid & Hazardous Waste

PROSPECTOR SQUARE MW-1
M.SALM BUREAU OF SOLID
AND HAZARDOUS WASTE

MW-1
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PROSPECTOR SQUARE | MW-1 | | | |
| Site ID: | | Source: | 00 | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704124 | Type: | 50 | Date of Review and QA Validation | |
| Sample Date: | 87/07/16 | Time: | | Inorganic Review: | 87/07/17 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/07/17 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | * | | ** | | * | | ** |
|---|---|---|---|---|---|---|---|
| T-Arsenic | <10.0 | ppm | (<.2) | T-Barium | 100.0 | ppm | (2.2) |
| T-Cadmium | 17 | ppm | (.36) | T-Chromium | 73.0 | ppm | (1.5) |
| T-Lead | 77.0 | ppm | (1.6) | T-Manganes | 980.0 | ppm | (2.6) |
| Mercury | <1.0 | ppm | (<.1) | T-Silver | 2.0 | ppm | (.04) |
| T-Zinc | 170.0 | ppm | (3.6) | % Solids | 83.3 | | |

Approved by: J. Oman ± 25%

* DRY WEIGHT BASIS
** AS RECEIVED BASIS

RECEIVED
SEP 01 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-1D

MW-1D
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY PS-SO-1D
Site ID: Source: 00
Cost Code: 900
Lab Number: 8704608 Type: 50
Sample Date: 87/07/21 Time: 14:50
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 60.0 ppm | T-Barium | 160.0 ppm |
| T-Cadmium | 7 ppm | T-Chromium | 60.0 ppm |
| T-Copper | 50.0 ppm | T-Iron | 21000.0 ppm |
| T-Lead | 220.0 ppm | T-Manganes | 640.0 ppm |
| Mercury | 0.2 ppm | T-Selenium | <40.0 ppm |
| T-Silver | <7.0 ppm | T-Zinc | 460.0 ppm |
| % Solids | 71.4 | | |

Rough
Estimate

8704589

| | | |
|---|---|---|
| T-AS | 47.000 | T-Arsenic, ug/l |
| T-BA | 110.00 | T-Barium, mg/l |
| T-CD | 6.000 | T-Cadmium, ug/l |
| T-CR | 100.00 | T-Chromium, ug/l |
| T-CU | 35.000 | T-Copper, ug/l |
| T-FE | 24000. | T-Iron, mg/l |
| T-PB | 110.00 | T-Lead, ug/l |
| T-MN | 880.00 | T-Manganese, ug/l |
| HG | .089 | Mercury, ug/l |
| T-SE | <30.000 | T-Selenium, ug/l |
| T-AG | < 6.000 | T-Silver, ug/l |
| T-ZN | 160.00 | T-Zinc, ug/l |
| ASHW | | Arsenic (HW), ppm |
| BAHW | | Barium (HW), ppm |
| CDHW | | Cadmium (HW), ppm |
| CRHW | | Chromium (HW), ppm |
| PBHW | | Lead (HW), ppm |
| HGHW | | Mercury (HW), ppm |
| SEHW | | Selenium (HW), ppm |
| AGHW | | Silver (HW), ppm |
| | 81.300 | % Solids |

MW1D TAILINGS

CW87123
MWD

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

Rough
Estimate

J. Oman

SILVER CREEK PS MW3 1'-2'
SOLID AND HAZARDOUS WASTE

MW-3
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK PS MW3 1'-2'
Site ID: CW87213 Source: 00
Cost Code: 365
Lab Number: 8704423 Type: 50
Sample Date: 87/07/28 Time: 08:41
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 380.0 ppm | T-Barium | 210.0 ppm |
| T-Cadmium | 190 ppm | T-Chromium | 57.0 ppm |
| T-Copper | 710.0 ppm | T-Iron | 22000.0 ppm |
| T-Lead | 13000.0 ppm | T-Manganes | 2000.0 ppm |
| Mercury | 3.7 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 67.0 ppm | T-Zinc | 23000.0 ppm |
| % Solids | | | |

Approved by:

RECEIVED

SEP 0 1 1987

Bureau of Solid
& Hazardous Waste

SILVER CREEK PS MW3 1'-2'
SOLID AND HAZARDOUS WASTE

MW-3
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | SILVER CREEK PS MW3 1'-2' | | | | |
| Site ID: | CW87213 | Source: 00 | | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704423 | Type: 50 | | Date of Review and QA Validation | |
| Sample Date: | 87/07/28 | Time: 08:41 | | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 380.0 ppm | T-Barium | 210.0 ppm |
| T-Cadmium | 190 ppm | T-Chromium | 57.0 ppm |
| T-Copper | 710.0 ppm | T-Iron | 22000.0 ppm |
| T-Lead | 13000.0 ppm | T-Manganes | 2000.0 ppm |
| Mercury | 3.7 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 67.0 ppm | T-Zinc | 23000.0 ppm |
| % Solids | 91.7 | | |

Approved by: J. Oman

Rough Estimate

PARK CITY MW-3
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICITY
+
T.M.

MW-3
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-3
Site ID: CW87120 Source: 00
Cost Code: 365
Lab Number: 8704586 Type: 40
Sample Date: 87/07/29 Time: 12:30
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | <180.0 | ppm | T-Barium | 260.0 | ppm |
| T-Cadmium | <40 | ppm | T-Chromium | 110.0 | ppm |
| T-Copper | 37.0 | ppm | T-Iron | 31000.0 | ppm |
| T-Lead | 150.0 | ppm | T-Manganes | 810.0 | ppm |
| Mercury | 0.1 | ppm | T-Selenium | <180.0 | ppm |
| T-Silver | <40.0 | ppm | T-Zinc | 410.0 | ppm |
| Arsenic HW | <0.2 | ppm | Barium HW | 0.36 | ppm |
| Cadmium HW | <0.05 | ppm | Cr (HW) | <0.03 | ppm |
| Lead (HW) | <0.2 | ppm | Mercury HW | <0 | ppm |
| Se (HW) | <0.2 | ppm | Silver HW | <0.01 | ppm |
| % Solids | 6.0 | | | | |

Approved by: J. Oman

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-3A

MW-3
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY PS-SO-3A
Site ID: Source: 00
Cost Code: 900
Lab Number: 8704610 Type: 50
Sample Date: 87/07/23 Time: 13:40
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 120.0 ppm | T-Barium | 76.0 ppm |
| T-Cadmium | 30 ppm | T-Chromium | 40.0 ppm |
| T-Copper | 160.0 ppm | T-Iron | 25000.0 ppm |
| T-Lead | 4800.0 ppm | T-Manganes | 1000.0 ppm |
| Mercury | 3.2 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 10.0 ppm | T-Zinc | 5400.0 ppm |
| % Solids | 82.3 | | |

Rough
Estimate

RECEIVED
SEP 14 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW-4
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-4
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW-4
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704246 Type: 50
Sample Date: 87/07/18 Time: 10:15
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | <45.0 ppm | T-Barium | 110.0 ppm |
| T-Cadmium | <5 ppm | T-Chromium | 27.0 ppm |
| T-Copper | 35.0 ppm | T-Iron | 17000.0 ppm |
| T-Lead | 97.0 ppm | T-Manganes | 280.0 ppm |
| Mercury | 0.02 ppm | T-Selenium | <45.0 ppm |
| T-Silver | <9.0 ppm | T-Zinc | 150.0 ppm |
| % Solids | 94.0 | | |

Approved by: J. Cman

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-4A

MW-4
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY PS-SO-4A
Site ID: Source: 00
Cost Code: 900
Lab Number: 8704609 Type: 50
Sample Date: 87/07/23 Time: 17:15
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 320.0 | ppm | T-Barium | 160.0 | ppm |
| T-Cadmium | 67 | ppm | T-Chromium | 87.0 | ppm |
| T-Copper | 510.0 | ppm | T-Iron | 25000.0 | ppm |
| T-Lead | 5600.0 | ppm | T-Manganes | 2800.0 | ppm |
| Mercury | 4.1 | ppm | T-Selenium | <25.0 | ppm |
| T-Silver | 40.0 | ppm | T-Zinc | 12000.0 | ppm |
| % Solids | 96.7 | | | | |

Rough
Estimate

RECEIVED

SEP 14 1987

Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW-5 1-1.5
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-5
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW-5 1-1.5
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704247 Type: 50
Sample Date: 87/07/20 Time: 11:40
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 410.0 ppm | T-Barium | 94.0 ppm |
| T-Cadmium | 83 ppm | T-Chromium | 36.0 ppm |
| T-Copper | 680.0 ppm | T-Iron | 20000.0 ppm |
| T-Lead | 6800.0 ppm | T-Manganes | 2100.0 ppm |
| Mercury | 4.5 ppm | T-Selenium | <26.0 ppm |
| T-Silver | 52.0 ppm | T-Zinc | 16000.0 ppm |
| % Solids | 95.2 | | |

Approved by: J. Conan

RECEIVED
SEP 14 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW5 4-5
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-5 (4-5 FT)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW5 4-5
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704248 Type: 50
Sample Date: 87/07/20 Time: 11:50
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 480.0 | ppm | T-Barium | 57.0 | ppm |
| T-Cadmium | 88 | ppm | T-Chromium | 31.0 | ppm |
| T-Copper | 570.0 | ppm | T-Iron | 17000.0 | ppm |
| T-Lead | 9300.0 | ppm | T-Manganes | 2400.0 | ppm |
| Mercury | 4.3 | ppm | T-Selenium | <26.0 | ppm |
| T-Silver | 57.0 | ppm | T-Zinc | 17000.0 | ppm |
| % Solids | 91.6 | | | | |

Approved by: J. Cir[illegible]

RECEIVED
SEP 14 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW 5-5--7-5
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-5 (5-7.5 FT)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW 5-5--7-5
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704249 Type: 50
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 380.0 | ppm | T-Barium | 59.0 | ppm |
| T-Cadmium | 92 | ppm | T-Chromium | 32.0 | ppm |
| T-Copper | 540.0 | ppm | T-Iron | 22000.0 | ppm |
| T-Lead | 7000.0 | ppm | T-Manganes | 1900.0 | ppm |
| Mercury | 2.3 | ppm | T-Selenium | <27.0 | ppm |
| T-Silver | 59.0 | ppm | T-Zinc | 15000.0 | ppm |
| % Solids | 91.8 | | | | |

Approved by: J. Cmcn

RECEIVED
SEP 14 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

SILVER CREEK MW5 7-9
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-5 (7-9FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: SILVER CREEK MW5 7-9
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704250 Type: 50
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/02
Organic Review:
Radiochemistry Review: 87/09/02
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 400.0 | ppm | T-Barium | 120.0 | ppm |
| T-Cadmium | 82 | ppm | T-Chromium | 33.0 | ppm |
| T-Copper | 660.0 | ppm | T-Iron | 16000.0 | ppm |
| T-Lead | 7700.0 | ppm | T-Manganes | 2100.0 | ppm |
| Mercury | 3.8 | ppm | T-Selenium | <27.0 | ppm |
| T-Silver | 55.0 | ppm | T-Zinc | 15000.0 | ppm |
| % Solids | 91.0 | | | | |

Approved by: J. Ouan

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-5A

MW-5
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY PS-SO-5A | | | | |
| Site ID: | | Source: | 00 | | |
| Cost Code: | 900 | | | | |
| Lab Number: | 8704612 | Type: | 50 | Date of Review and QA Validation | |
| Sample Date: | 87/07/24 | Time: | 14:50 | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 210.0 ppm | T-Barium | 75.0 ppm |
| T-Cadmium | 40 ppm | T-Chromium | 33.0 ppm |
| T-Copper | 420.0 ppm | T-Iron | 23000.0 ppm |
| T-Lead | 4400.0 ppm | T-Manganes | 1300.0 ppm |
| Mercury | 5.1 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 27.0 ppm | T-Zinc | 7000.0 ppm |
| % Solids | 84.7 | | |

Rough
Estimate

PARK CITY PS-MW-6
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICITY
+
T.M.

MW-6
~~0~~ LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY PS-MW-6
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704290 Type: 40
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 50.0 ppm | T-Barium | 540.0 ppm |
| T-Cadmium | 20 ppm | T-Chromium | 110.0 ppm |
| T-Copper | 61.0 ppm | T-Iron | 32000.0 ppm |
| T-Lead | 480.0 ppm | T-Manganes | 1500.0 ppm |
| Mercury | 4.0 ppm | T-Selenium | <50.0 ppm |
| T-Zinc | 1500.0 ppm | Arsenic HW | <0.2 ppm |
| Barium HW | 0.34 ppm | Cadmium HW | 0.06 ppm |
| Cr (HW) | <0.03 ppm | Lead (HW) | <0.2 ppm |
| Mercury HW | <0 ppm | Se (HW) | <0.2 ppm |
| Silver HW | <0.01 ppm | % Solids | 14.1 |

Approved by: J. Oman

PARK CITY PS-MW-7
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICITY
+
T.M

MW-7
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY PS-MW-7
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704288 Type: 40
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | <100.0 | ppm | T-Barium | 920.0 | ppm |
| T-Cadmium | 42 | ppm | T-Chromium | 190.0 | ppm |
| T-Copper | 210.0 | ppm | T-Iron | 46000.0 | ppm |
| T-Lead | 1900.0 | ppm | T-Manganes | 1700.0 | ppm |
| Mercury | 12.0 | ppm | T-Selenium | <100.0 | ppm |
| T-Zinc | 2900.0 | ppm | Arsenic HW | <0.2 | ppm |
| Barium HW | 0.22 | ppm | Cadmium HW | 0.08 | ppm |
| Cr (HW) | <0.03 | ppm | Lead (HW) | 0.25 | ppm |
| Mercury HW | 0.002 | ppm | Se (HW) | <0.2 | ppm |
| Silver HW | <0.01 | ppm | % Solids | 5.9 | |

Approved by: J. Oman

PARK CITY PS-MW-7
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICTY
+
T.M.

MW-7
LIQUID

# UTAH STATE HEALTH LABORATORY
## Environmental Chemistry Analysis Report

Description: PARK CITY PS-MW-7
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704289 Type: 40
Sample Date: 87/07/20 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 130.0 | ppm | T-Barium | 800.0 | ppm |
| T-Cadmium | 32 | ppm | T-Chromium | 160.0 | ppm |
| T-Copper | 260.0 | ppm | T-Iron | 40000.0 | ppm |
| T-Lead | 2600.0 | ppm | T-Manganes | 1600.0 | ppm |
| Mercury | 6.6 | ppm | T-Selenium | <80.0 | ppm |
| T-Zinc | 3700.0 | ppm | Arsenic HW | <0.2 | ppm |
| Barium HW | 0.27 | ppm | Cadmium HW | 0.12 | ppm |
| Cr (HW) | <0.03 | ppm | Lead (HW) | 0.48 | ppm |
| Mercury HW | 0.007 | ppm | Se (HW) | <0.2 | ppm |
| Silver HW | <0.01 | ppm | % Solids | 16.6 | |

Approved by: J. Oman

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY MW-8
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-8
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-8
Site ID: CW87121 Source: 00
Cost Code: 365
Lab Number: 8704587 Type: 40
Sample Date: 87/07/30 Time:
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 49.0 | ppm | T-Barium | 180.0 | ppm |
| T-Cadmium | 7 | ppm | T-Chromium | 70.0 | ppm |
| T-Copper | 28.0 | ppm | T-Iron | 23000.0 | ppm |
| T-Lead | 120.0 | ppm | T-Manganes | 920.0 | ppm |
| Mercury | 1.1 | ppm | T-Selenium | <40.0 | ppm |
| T-Silver | <7.0 | ppm | T-Zinc | 470.0 | ppm |
| % Solids | 28.2 | | | | |

Approved by: J. Oman

Rough Estimate

PARK CITY MW-8
BUREAU OF SOLID AND HAZAR
DOUS WASTE

E.P. TOXICITY
+
T.M.

MW-8
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | |
|---|---|---|---|
| Description: | PARK CITY MW-8 | | |
| Site ID: | CW87124 | Source: | 00 |
| Cost Code: | 365 | | |
| Lab Number: | 8704583 | Type: | 40 |
| Sample Date: | 87/07/30 | Time: | 09:00 |
| Tot. Cations: | | | |
| Tot. Anions: | | me/l Cations: | |
| Grand Total: | | me/l Anions: | |

Date of Review and QA Validation
Inorganic Review:
Organic Review:
Radiochemistry Review:
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 70.0 ppm | T-Barium | 90.0 ppm |
| T-Cadmium | 16 ppm | T-Chromium | 110.0 ppm |
| T-Copper | 60.0 ppm | T-Iron | 21000.0 ppm |
| T-Lead | 470.0 ppm | T-Manganes | 920.0 ppm |
| Mercury | 0.7 ppm | T-Selenium | <30.0 ppm |
| T-Silver | <6.0 ppm | T-Zinc | 1800.0 ppm |
| Arsenic HW | <0.2 ppm | Barium HW | 0.23 ppm |
| Cadmium HW | 0.15 ppm | Cr (HW) | <0.03 ppm |
| Lead (HW) | <0.2 ppm | Mercury HW | <0 ppm |
| Se (HW) | <0.2 ppm | Silver HW | <0.01 ppm |
| % Solids | 83.6 | | |

Approved by: J. Oman

RECEIVED

SEP 0 1 1987

Bureau of Solid
& Hazardous Waste

PARK CITY/SILVER CREEK PS MW 9 1-5'-2'
SOLID AND HAZARDOUS WASTE

MW-9 (1.5-2 FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY/SILVER CREEK PS MW 9 1-5'-2'
Site ID: CW87211 Source: 00
Cost Code: 365
Lab Number: 8704421 Type: 50
Sample Date: 87/07/28 Time: 12:15
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 460.0 ppm | T-Barium | 14.0 ppm |
| T-Cadmium | 220 ppm | T-Chromium | 35.0 ppm |
| T-Copper | 490.0 ppm | T-Iron | >72000.0 ppm |
| T-Lead | 8500.0 ppm | T-Manganes | 2000.0 ppm |
| Mercury | 0.8 ppm | T-Selenium | 60.0 ppm |
| T-Silver | 59.0 ppm | T-Zinc | 31000.0 ppm |
| % Solids | 90.0 | | |

Approved by: J. Oman

Rough estimate

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY/SILVER CREEK PS MW9 3'-3.5'
SOLID AND HAZARDOUS WASTE

MW-9 (3-3.5 FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY/SILVER CREEK PS MW9 3'-3.5' | | | | |
| Site ID: | CW87212 | Source: | 00 | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704422 | Type: | 50 | Date of Review and QA Validation | |
| Sample Date: | 87/07/28 | Time: | 12:30 | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/1 Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/1 Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 430.0 | ppm | T-Barium | 66.0 | ppm |
| T-Cadmium | 77 | ppm | T-Chromium | 33.0 | ppm |
| T-Copper | 630.0 | ppm | T-Iron | 34000.0 | ppm |
| T-Lead | 8300.0 | ppm | T-Manganes | 1900.0 | ppm |
| Mercury | 4.5 | ppm | T-Selenium | <30.0 | ppm |
| T-Silver | 50.0 | ppm | T-Zinc | 13000.0 | ppm |
| % Solids | 86.0 | | | | |

Approved by: J. Oman

Rough Estimate

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY SILVER CREEK PS MW9-29-30
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-9 (29-30 FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK PS MW9-29-30
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704420 Type: 50
Sample Date: 87/07/28 Time: 12:20
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 530.0 | ppm | T-Barium | 18.0 | ppm |
| T-Cadmium | 130 | ppm | T-Chromium | 29.0 | ppm |
| T-Copper | 730.0 | ppm | T-Iron | >76000.0 | ppm |
| T-Lead | 9400.0 | ppm | T-Manganes | 1800.0 | ppm |
| Mercury | 3.0 | ppm | T-Selenium | 60.0 | ppm |
| T-Silver | 53.0 | ppm | T-Zinc | 19000.0 | ppm |
| % Solids | 83.4 | | | | |

Approved by: J. Oman

Rough Estimate

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY MW-10 2-4
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-10 (2-4 FT.)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-10 2-4
Site ID: CW87126 Source: 00
Cost Code: 365
Lab Number: 8704585 Type: 40
Sample Date: 87/07/31 Time: 09:55
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/08/31
Organic Review:
Radiochemistry Review: 87/08/31
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 370.0 | ppm | T-Barium | 56.0 | ppm |
| T-Cadmium | 56 | ppm | T-Chromium | 19.0 | ppm |
| T-Copper | 620.0 | ppm | T-Iron | 11000.0 | ppm |
| T-Lead | 8700.0 | ppm | T-Manganes | 1800.0 | ppm |
| Mercury | 4.9 | ppm | T-Selenium | <30.0 | ppm |
| T-Silver | 56.0 | ppm | T-Zinc | 12000.0 | ppm |
| % Solids | 83.0 | | | | |

Approved by: J. Oman

Rough Estimate

RECEIVED

SEP 0 1 1987

Bureau of Solid
& Hazardous Waste

PARK CITY MW-10
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-10
LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY MW-10 | | | | |
| Site ID: | CW87122 | Source: 00 | | | |
| Cost Code: | 365 | | | | |
| Lab Number: | 8704588 | Type: 40 | | Date of Review and QA Validation | |
| Sample Date: | 87/07/31 | Time: 09:00 | | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 830.0 | ppm | T-Barium | 250.0 | ppm |
| T-Cadmium | <85 | ppm | T-Chromium | <85.0 | ppm |
| T-Copper | 1100.0 | ppm | T-Iron | 36000.0 | ppm |
| T-Lead | 12000.0 | ppm | T-Manganes | 1800.0 | ppm |
| Mercury | 18.0 | ppm | T-Selenium | <420.0 | ppm |
| T-Silver | 80.0 | ppm | T-Zinc | 14000.0 | ppm |
| % Solids | 2.8 | | | | |

Approved by: J Oman

Rough Estimate

RECEIVED
SEP 14 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

PARK CITY MW-10 1-2
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-10 (1-2 FT)
TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY MW-10 1-2
Site ID: CW87125 Source: 00
Cost Code: 365
Lab Number: 8704584 Type: 40
Sample Date: 87/07/31 Time: 09:49
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/01
Organic Review:
Radiochemistry Review: 87/09/01
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 210.0 ppm | T-Barium | 32.0 ppm |
| T-Cadmium | 63 ppm | T-Chromium | 32.0 ppm |
| T-Copper | 360.0 ppm | T-Iron | 20000.0 ppm |
| T-Lead | 4800.0 ppm | T-Manganes | 1900.0 ppm |
| Mercury | 3.7 ppm | T-Selenium | <32.0 ppm |
| T-Silver | 32.0 ppm | T-Zinc | 11000.0 ppm |
| % Solids | 91.0 | | |

Approved by: J. Oman

CUTTINGS/H2O SAMPLES
FROM DRILLING

RECEIVED
OCT 02 1987
Utah Dept. of Health
Bureau of Solid & Hazardous Waste

PARK CITY SILVER CREEK/PROSPECTOR SQUARE MW-12
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-12 (TAILINGS) = 2D

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK/PROSPECTOR SQUARE MW-12 = 2D
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704876 Type: 40
Sample Date: 87/08/14 Time: 16:00
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/30
Organic Review:
Radiochemistry Review: 87/09/30
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 51.0 ppm | T-Barium | 72.0 ppm |
| T-Cadmium | 7.2 ppm | T-Chromium | 33.0 ppm |
| T-Copper | 22.0 ppm | T-Iron | 20000.0 ppm |
| T-Lead | 72.0 ppm | T-Manganes | 720.0 ppm |
| Mercury | 0.04 ppm | T-Selenium | <12.0 ppm |
| T-Silver | <0.6 ppm | T-Zinc | 190.0 ppm |
| Arsenic HW | <0.5 ppm | Barium HW | 0.15 ppm |
| Cadmium HW | <0.13 ppm | Cr (HW) | <0.08 ppm |
| Lead (HW) | <0.5 ppm | Mercury HW | <0 ppm |
| Se (HW) | <0.5 ppm | Silver HW | <0.03 ppm |
| % Solids | 82.9 | | |

Approved by: J. Oman

PARK CITY SILVER CREEK/PROSPECTOR SQUARE MW-12
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-12(CUTTINGS) = 2D - LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK/PROSPECTOR SQUARE MW-12 = 2D
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704875 Type: 40
Sample Date: 87/08/14 Time: 16:00
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/30
Organic Review:
Radiochemistry Review: 87/09/30
Microbiology Review:

Laboratory Analyses

| | | | | | |
|---|---|---|---|---|---|
| T-Arsenic | 130.0 | ppm | T-Barium | 230.0 | ppm |
| T-Cadmium | <23 | ppm | T-Chromium | 98.0 | ppm |
| T-Copper | 54.0 | ppm | T-Iron | 37000.0 | ppm |
| T-Lead | 360.0 | ppm | T-Manganes | 1600.0 | ppm |
| Mercury | 0.58 | ppm | T-Selenium | <90.0 | ppm |
| T-Silver | <5.0 | ppm | T-Zinc | 490.0 | ppm |
| Arsenic HW | <0.5 | ppm | Barium HW | 0.75 | ppm |
| Cadmium HW | <0.13 | ppm | Cr (HW) | <0.08 | ppm |
| Lead (HW) | <0.5 | ppm | Mercury HW | <0 | ppm |
| Se (HW) | <0.5 | ppm | Silver HW | <0.03 | ppm |
| % SOLIDS | 3.8 | | | | |

Approved by: J. Oman

PARK CITY SILVER CREEK / PROSPECTOR SQUARE
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-12 = 2D TAILINGS

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK / PROSPECTOR SQUARE
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704874 Type: 40
Sample Date: 87/08/13 Time: 11:28
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/30
Organic Review:
Radiochemistry Review: 87/09/30
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 34.0 ppm | T-Barium | 54.0 ppm |
| T-Cadmium | 5.3 ppm | T-Chromium | 37.0 ppm |
| T-Copper | 21.0 ppm | T-Iron | 13000.0 ppm |
| T-Lead | 97.0 ppm | T-Manganes | 260.0 ppm |
| Mercury | 0.04 ppm | T-Selenium | <12.0 ppm |
| T-Silver | 1.7 ppm | T-Zinc | 160.0 ppm |
| Arsenic HW | <0.5 ppm | Barium HW | 0.25 ppm |
| Cadmium HW | <0.12 ppm | Cr (HW) | <0.08 ppm |
| Lead (HW) | <0.5 ppm | Mercury HW | <0 ppm |
| Se (HW) | <0.5 ppm | Silver HW | <0.03 ppm |
| % Solids | 82.2 | | |

Approved by: J. Oman

RECEIVED
OCT 02 87
Utah Dept. of Health
Bureau of Solid & Hazard

PARK CITY SILVER CREEK/PROSPECTOR SQUARE
BUREAU OF SOLID AND HAZAR
DOUS WASTE

MW-12 =2D LIQUID

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

Description: PARK CITY SILVER CREEK/PROSPECTOR SQUARE
Site ID: Source: 00
Cost Code: 365
Lab Number: 8704873 Type: 40
Sample Date: 87/08/13 Time: 11:40
Tot. Cations:
Tot. Anions: me/l Cations:
Grand Total: me/l Anions:

Date of Review and QA Validation
Inorganic Review: 87/09/30
Organic Review:
Radiochemistry Review: 87/09/30
Microbiology Review:

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 140.0 ppm | T-Barium | 300.0 ppm |
| T-Cadmium | <35 ppm | T-Chromium | 84.0 ppm |
| T-Copper | 34.0 ppm | T-Iron | 31000.0 ppm |
| T-Lead | 150.0 ppm | T-Manganes | 300.0 ppm |
| Mercury | 0.1 ppm | T-Selenium | <140.0 ppm |
| T-Silver | <7.0 ppm | T-Zinc | 320.0 ppm |
| Arsenic HW | <0.5 ppm | Barium HW | 0.95 ppm |
| Cadmium HW | <0.13 ppm | Cr (HW) | <0.08 ppm |
| Lead (HW) | <0.5 ppm | Mercury HW | <0 ppm |
| Se (HW) | <0.5 ppm | Silver HW | <0.03 ppm |
| % SOLIDS | 3.0 | | |

Approved by: J. Oman

RECEIVED
SEP 0 1 1987
Bureau of Solid
& Hazardous Waste

PARK CITY PS-SO-LARSON

UTAH STATE HEALTH LABORATORY
Environmental Chemistry Analysis Report

| | | | | | |
|---|---|---|---|---|---|
| Description: | PARK CITY PS-SO-LARSON | | | | |
| Site ID: | | Source: 00 | | | |
| Cost Code: | 900 | | | | |
| Lab Number: | 8704611 | Type: 50 | | Date of Review and QA Validation | |
| Sample Date: | 87/07/24 | Time: 17:55 | | Inorganic Review: | 87/08/31 |
| Tot. Cations: | | | | Organic Review: | |
| Tot. Anions: | | me/l Cations: | | Radiochemistry Review: | 87/08/31 |
| Grand Total: | | me/l Anions: | | Microbiology Review: | |

Laboratory Analyses

| | | | |
|---|---|---|---|
| T-Arsenic | 150.0 ppm | T-Barium | 150.0 ppm |
| T-Cadmium | 30 ppm | T-Chromium | 210.0 ppm |
| T-Copper | 280.0 ppm | T-Iron | 37000.0 ppm |
| T-Lead | 2900.0 ppm | T-Manganes | 2800.0 ppm |
| Mercury | 2.5 ppm | T-Selenium | <30.0 ppm |
| T-Silver | 20.0 ppm | T-Zinc | 4000.0 ppm |
| % Solids | 95.7 | | |

Rough
Estimate

ATTACHMENT H

SAMPLING DATA

SAMPLING ROUND I

U.S. ENVIRONMENTAL PROTECTION AGENCY
GROUNDWATER DATA

EPA-GW-I

[] - indicated concentration detected at less thancontract requried detection limits

u - indicates - undetected at this concentration

uj - detection limit estimated because not all quality control criteria were met

j - estimated value; not all quality control criteria were met

r - registered data

AFT

TABLE 1
INORGANIC ANALYTICAL RESULTS, GROUND AND DRAIN WATERS (ug[illegible])
PROSPECTOR SQUARE, PARK CITY, UTAH
CASE [illegible]

INORGANIC ANALYTI
PROS

| SAMPLE # TRAFFIC # LOCATION | PS-MW-1S MHC-183 UPGRDNT W OF SITE | PS-MW-1D MHC-184 DEEP W. OF SITE | PS-MW-[illegible] MHC-860 DEEP N. OF SITE | [illegible] MHB-14[illegible] ONSITE S. | [illegible]-W-2S [illegible]-185 N.W. BORY | PS-MW-[illegible] MB-10[illegible] ONSITE [illegible] | PS-MW-8 MHG-991 ONSITE | [illegible]-MW-5 MHB-150 ONSITE | PS-MW-6 MHG-894 ONSITE | PS-MW-7 MHG-895 ONSITE | PS-MW-11 MB-105 N. OF SITE | PS-MW-9 MHB-101 ONSITE E. | PS-MW-10 MHB-103 E. OF SITE | PS-MW-13 MHG-836 BLANK | P[illegible] M[illegible] D[illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 100u | 100u | [135] | 100u | 100u | 100u | 100u | 100u | [136] | 100u | 100u | 100u | 100u | 100u | 1[illegible] |
| Antimony | 33u | 33u | 33u | 33u | 33u | 33u | 33u | 33u | 33u | 33u | 33u | 33u | [54.5] | 33u | 3[illegible] |
| Arsenic | 6u | 6u | 6u | 6u | 6u | 6u | 6u | 6u | 6u | 6u | 6u | 6u | 23.2 | 6u | 6[illegible] |
| Barium | [103]j | [91.6]j | [52.6]n | 40ur | [47.1]j | [101]j | 40ur | [42.5]j | 40ur | 40ur | [67.4]j | [57.4]j | [110]j | 40ur | [[illegible] |
| Beryllium | 4u | 4u | 4u | 4u | 4u | 4u | 4u | 4u | 4u | 4u | 4u | 4u | 4u | 4u | 4[illegible] |
| Cadmium | 4u | 4u | 4u | 6.4 | 4u | 4u | 17.9 | 7.1 | 5.9 | 8.1 | 4u | 4u | 8.6 | 4u | 4[illegible] |
| Calcium | 354000 | 220000 | 64800 | 226000 | 21900 | 184000 | 228000 | 206000 | 247000 | 269000 | 330000 | 206000 | 140000 | 740u | 69[illegible] |
| C[illegible]ium | 9u | 9u | 9u | 9u | 9u | 9u | 9u | 9u | 9u | 9u | 9u | 9u | 9u | 9u | 9[illegible] |
| Co[illegible]alt | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7[illegible] |
| Copper | 17u | 17u | 17u | 17u | 17u | 27.8 | 17u | 17u | 17u | 17u | 17u | 17u | [18.5] | 17u | 1[illegible] |
| Iron | 100u | 100u | 100u | 100u | 100u | 100u | 100u | 100u | 136 | 100u | 100u | 100u | 100u | 100u | 1[illegible] |
| Lead | 20uj | 20uj | [2.75]j | 2uj | 2uj | 20uj | 2uj | 2uj | 2uj | 2uj | 2uj | 20uj | 43.4j | [2.31]j | 2[illegible] |
| Cyanide | 10u | 10u | 10u | 10u | 10u | 10u | 10u | 10u | 10u | 10u | 10u | 10u | 10u | 10u | 1[illegible] |
| Magnesium | 61700 | 41300 | 17600 | 39100 | 41800 | 35900 | 32200 | 35200 | 34000 | 33200 | 58800 | 32800 | 36300 | 344u | 18[illegible] |
| Manganese | 99.1 | 434 | 39.4 | 317 | 79.7 | [8.8] | 441 | 126 | 456 | 248 | 577 | 1290 | 1130 | 6u | 41[illegible] |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.[illegible] |
| Nickel | 6u | [7.0] | 6u | 6u | 6u | 6u | [8.0] | [12.4] | 6u | [10.2] | 6u | 6u | 6u | 6u | 6[illegible] |
| Potassium | [4030] | [2320] | 500u | 8100 | [1570] | [1630] | 7490 | 5250 | 5480 | 7050 | [1880] | [2650] | [3130] | 500u | 50[illegible] |
| Selenium | 20uj | 2uj | 2uj | 20uj | 2uj | 2uj | 2uj | 20uj | 20uj | 20uj | 20uj | 2uj | 2uj | 2uj | 2[illegible] |
| Silver | [9.2] | 7u | [7.6] | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | 7u | [9.7] | 7u | 7[illegible] |
| Sodium | 277000 | 72100 | 11500 | 54900 | 51100 | 114000 | 48800 | 57100 | 44600 | 53100 | 44600 | 68100 | 46900 | 1045u | 12[illegible] |
| Thallium | 80u | 80u | 8u | 8u | 8u | 8u | 8u | 8u | 8u | 8u | 8u | 8u | 8u | 8u | 8[illegible] |
| Vanadium | [21.8] | [18.2] | [15.3] | [13.7] | [13.1] | 12u | [19.5] | [17.4] | [18.6] | [19.8] | [15.6] | [14.5] | 12u | 12u | 1[illegible] |
| Zinc | 22.5 | 7u | 7u | 1940 | 7u | 7u | 3210 | 2460 | 1210 | 2200 | [9.9] | [7.7] | 1950 | 7u | 7[illegible] |

SAMPLING ROUND II

U.S. ENVIRONMENTAL PROTECTION AGENCY
GROUNDWATER DATA

EPA-GW-II

# TABLE 1
## INORGANIC ANALYTICAL RESULTS GROUND AND DRAIN WATERS (µg/l)
## PROSPECTOR SQUARE, PARK CITY, UTAH
## SAS #3489H
## DECEMBER, 1987

| SAMPLE # | PS-MW-1S | PS-MW-1D | PS-MW-2D | PS-DR-1 | PS-DR-2 | PS-MW-2 |
|---|---|---|---|---|---|---|
| TRAFFIC # | 8-57454 | 8-57451 | 8-57460 | 8-57488 | 8-57497 | 8-57457 |
| LOCATION | UPGRAD | UPGRAD | UPGRAD | DRAIN | DRAIN | ON-SITE |
| Aluminum | 90u | [113] | 90u | [94] | 90u | 90u |
| Antimony | 45uj | 45uj | 45uj | [46] | 45uj | 45uj |
| Arsenic | 2u | 2u | 2u | 3.9 | 7.8 | 2u |
| Barium | [109]je | [79]je | [66]je | [20]je | [81]je | [67]je |
| Beryllium | 2u | 2u | 2u | 2u | 2u | 2u |
| Cadmium | [0.7] | 1.3 | .2u | 27 s | 1.5 | [0.4] |
| Calcium | 359,000 | 249,000 | 74,200 | 208,000 | 226,000 | 255,000 |
| Chromium | 10u | 10u | 10u | 10u | 10u | 10u |
| Cobalt | 25u | 25u | 25u | 25u | 25u | 25u |
| Copper | 8u | [18] | 8u | 8u | 8u | 8u |
| Iron | [57] | 101 | [23] | 301 | 6510 | [26] |
| Lead | [1.7] | [1.6] | [1.3] | 7.0 | 5.1 | [1.8] |
| Magnesium | 62,100 | 49,300 | 20,300 | 28,500 | 47,400 | 50,500 |
| Manganese | 99 | 80 | [8] | 574 | 2,190 | 32 |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u |
| Nickel | 22u | 22u | 22u | 22u | 22u | 22u |
| Potassium | [3520]je | [2390]je | [1110]je | [4480]je | [2940]je | [2040]je |
| Selenium | 2u | 2u | 2u | 2.0 | 2u | 2u |
| Silver | 6u | 6u | 6u | 6u | 6u | 6u |
| Sodium | 310,000 | 91,110 | 11,000 | 44,200 | 43,300 | 61,500 |
| Thallium | 2u | 2u | 2u | 2u | 2u | 2u |
| Vanadium | 13u | 13u | 13u | 13u | 13u | 13u |
| Zinc | 71 | 85 | [17] | 2,460 | 245 | 22 |
| Cyanide | 10uj | 10uj | 10uj | 10uj | 10uj | 10uj |

s - Indicates the value reported was determined by method of standard addition and is estimated.

j - The associated numerical value is an estimated quantity because the amount detected is below the required limits or becasue quality control criterias were not met.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

je - Indicates a value estimated or not reported due to presence of interference.

[] -Amount report is above is above instrument detection limits but below contract required detection limits. The value is an estimation.

TABLE 2
INORGANIC ANALYTICAL RESULTS GROUND WATERS (µg/l)
PROSPECTOR SQUARE, PARK CITY, UTAH
SAS #3489H

| SAMPLE # | PS-MW-3 | PS-MW-4 | PS-MW-5 | PS-MW-6 | PS-MW-7 | PS-MW-8 |
|---|---|---|---|---|---|---|
| TRAFFIC # | 8-57463 | 8-57466 | 8-57469 | 8-57475 | 8-57479 | 8-57472 |
| LOCATION | ON-SITE | ONSITE TRP | ON-SITE | ON-SITE | ON-SITE | ON-SITE |
| Aluminum | 90u | 90u | 90u | 90u | 429 | 90u |
| Antimony | 45uj | 45uj | 45uj | [55] | 45uj | 45uj |
| Arsenic | 2u | 2u | 2u | 2u | 2.1 | [3.8] |
| Barium | [86]je | [47]je | [49]je | [23]je | [22]je | [24]je |
| Beryllium | 2u | 2u | 2u | 2u | 2u | 2u |
| Cadmium | [0.2] | 3.2 | 3.1 | 5.8s | 9.8s | 16 |
| Calcium | 186,000 | 262,000 | 189,000 | 236,000 | 225,000 | 203,000 |
| Chromium | 10u | 10u | 10u | 10u | 10u | 15 |
| Cobalt | 25u | 25u | 25u | 25u | 25u | 25u |
| Copper | 8u | 8u | 8u | 8u | 8u | 8u |
| Iron | 100 | 145 | [32] | [89] | 442 | [21] |
| Lead | [2.5] | [3.1] | [2.7] | [2.0] | [4.0] | 9.3 |
| Magnesium | 36,900 | 47,800 | 34,800 | 33,200 | 29,200 | 30,300 |
| Manganese | [5] | 2,250 | 276 | 287 | 70 | 472 |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u |
| Nickel | 22u | 22u | 22u | 22u | 22u | 22u |
| Potassium | [1940]je | 6930je | [3390]je | [4300]je | 5340je | 6160je |
| Selenium | 2u | 2u | 2u | 2u | 2.4 | 2u |
| Silver | 6u | 6u | 6u | 6u | 6u | 6u |
| Sodium | 134,000 | 62,600 | 55,200 | 43,800 | 50,300 | 49,900 |
| Thallium | 2u | 2u | 2u | 2u | 2u | 2u |
| Vanadium | 13u | 13u | 13u | 13u | 13u | 13u |
| Zinc | [16] | 759 | 899 | 1,300 | 2,150 | 2,890 |
| Cyanide | 10uj | 10uj | 10uj | 10uj | 10uj | 10uj |

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

je - Indicates a value estimated or nor reported due to presence of interference. (Used when serial dilutions results are not within required limits).

uj - Detection limit is estimated because quality control criteria were not met.

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

s - Indicates the value reported was determined by method of standard addition and is estimated.

TABLE 3
INORGANIC ANALYTICAL RESULTS GROUND WATERS (μg/l)
PROSPECTOR SQUARE, PARK CITY, UTAH
SAS #3489H

| SAMPLE # | PS-MW-9 | PS-MW-10 | PS-MW-11 | PS-MW-12 | PS-MW-13 | PS-MW-14 | PS-MW-17 |
|---|---|---|---|---|---|---|---|
| TRAFFIC # | 8-57482 | 8-57491 | 8-57494 | 8-57500 | 8-53622 | 8-53624 | 8-57485 |
| LOCATION | ON-SITE | ON-SITE | ON-SITE | BLANK | TRIP | SPIKE | DUP MW-9 |
| Aluminum | [123] | 90u | 1000 | 90u | 90u | 90u | 90u |
| Antimony | 45uj | [46] | 45u | 45uj | 45uj | 45uj | 45uj |
| Arsenic | 3.4 | 11 | 2u | 2u | 2.0 | 9.4 | 5.5 |
| Barium | [43]je | [94]je | [42]je | [2]je | [3]je | 2uje | [48]je |
| Beryllium | 2u | 2u | 2u | 2u | 2u | 10 | 2u |
| Cadmium | 0.2u | 3.8 | [0.9] | [0.3] | 0.2u | 2.7 | [0.4] |
| Calcium | 164,000 | 131,000 | 204,000 | [235] | [39] | [43] | 178,000 |
| Chromium | 10u | 10u | 10u | 11 | 10u | 17 | 10u |
| Cobalt | 25u | 25u | 25u | 25u | 25u | 25u | 25u |
| Copper | 8u | 8u | 8u | 8u | 8u | [17] | [10] |
| Iron | 476 | [28] | 1010 | [80] | [29] | [47] | 164 |
| Lead | 7.4 | 22 | 5.0 | 5.0 | [2.9] | 10 | 7.6 |
| Magnesium | 26,800 | 38,500 | 38,100 | [81] | 75u | 75u | 28,600 |
| Manganese | 1400 | 442 | 320 | 3u | 3u | [10] | 1450 |
| Mercury | 0.2u | 0.52 | 0.2u | 0.2u | 0.2u | 0.35 | 0.2u |
| Nickel | 22u | 22u | 22u | 22u | 22u | 22u | 22u |
| Potassium | [2190]je | [1950]je | [1930]je | 372uje | 372uje | 372uje | [2330]je |
| Selenium | 2u | 2u | 2u | 2u | 2u | 2.5 | 2u |
| Silver | 6u | 6u | 6u | 6u | 6u | 6u | 6u |
| Sodium | 48,700 | 40,900 | 34,300 | [185] | [170] | [187] | 55,200 |
| Thallium | 2u | 2u | 2u | 2u | 2u | 2u | 2u |
| Vanadium | 13u | 13u | 13u | 13u | 13u | [13] | 13u |
| Zinc | [16] | 697 | 31 | 13u | [13] | 48 | [19] |
| Cyanide | 10uj | 10uj | 10uj | 10uj | nr | nr | 10uj |

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

uj - Detection limit is estimated because quality control criteria were not met.

je - Indicates a value estimated or nor reported due to presence of interference. (Used when serial dilutions results are not within required limits).

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

nr - Analysis was not required.

PERFORMANCE EVALUATION SAMPLE

BLIND SPIKE SOLUTION PREPARED AS A
COMPARABILITY STANDARD FOR CASE #3489H
ANALYSIS OF 18 LOW WASTER SAMPLES FROM
PROSPECTOR SQUARE, PARK CITY, UTAH

| PARAMETER | TRUE VALUE | AVERAGE | 95% CONFIDENCE INTERVAL |
|---|---|---|---|
| Aluminum | 50 | 52.26 | 42.3-62.3 |
| Arsenic | 10 | 9.92 | 7.72-12.1 |
| Beryllium | 10 | 9.89 | 8.61-11.2 |
| Cadmium | 2.5 | 2.38 | 1.99-2.77 |
| Cobalt | 10 | 9.90 | 8.55-11.3 |
| Chromium | 10 | 9.81 | 7.77-11.8 |
| Copper | 10 | 10.02 | 8.78-11.3 |
| Iron | 10 | 10.09 | 8.33-11.9 |
| Mercury | .5 | .490 | .338-.642 |
| Manganese | 10 | 9.92 | 8.76-11.1 |
| Nickel | 10 | 9.99 | 8.41-11.6 |
| Lead | 10 | 9.96 | 8.28-11.6 |
| Selenium | 2.5 | 2.31 | 1.50-3.12 |
| Vanadium | 25 | 25.6 | 21.3-29.9 |
| Zinc | 10 | 10.07 | 8.59-11.5 |

Statistics using sample preparation instructions (dil: 1:10)

U.S. EPA QC sample used - Trace Metal I, 1990, WP 386.

All values are expressed as µg/l.

PEFORMANCE SAMPLE COMPARISON (ug/l)

| | TRUE VALUE | CLP | COMMENT | STATE | COMMENT |
|---|---|---|---|---|---|
| Aluminum | 50 | 90u | * | <400 | * |
| Arsenic | 10 | 9.4 | + | 8.0 | + |
| Beryllium | 10 | 10 | + | 9.0 | + |
| Cadmium | 2.5 | 2.7 | + | 3.0 | + |
| Cobalt | 10 | 25u | * | <20 | * |
| Chromium | 10 | 17 | 51% diff | 10 | + |
| Copper | 10 | [17] | * | <20 | * |
| Iron | 10 | [47] | * | <20 | * |
| Mercury | 0.5 | 0.35 | + | 0.3 | 50% diff |
| Manganese | 10 | [10] | + | 9.0 | + |
| Nickel | 10 | 22u | * | 10 | + |
| Lead | 10 | 10 | + | 10 | + |
| Selenium | 2.5 | 2.5 | + | 4.0 | 46% diff |
| Vanadium | 25 | [13] | * | - | NR |
| Zinc | 10 | 48 | * | <30 | * |

*- Instrument detection limits (IDL) greater than the spike concentrations. Calibration linearity at IDL tends to be questionable since no standards are analyzed at those low concentrations. (i.e. CLP results for iron and zinc).
+- Results within 25% of each other.
[]- Results reported are above the instrument detection limits, but below the contract required detection limits.

When comparing the results from the State of Utah to the Contract Laboratory Program (CLP), the following calculation was used, (which is used to determine difference in duplicate samples from the CLP users guide), ((s-d)/((s+d)/2))x100 where s=sample and d=duplicate. The State of Utah did not analyze the following elements; antimony, thallium, and vanadium. The percent difference for samples and duplicates should fall within 25% difference of each other for duplicates on in house samples.

SAMPLING ROUND III

U.S. ENVIRONMENTAL PROTECTION AGENCY
GROUNDWATER DATA

EPA-GW-III

# TABLE 1
## INORGANIC ANALYTICAL RESULTS, GROUND AND DRAIN WATERS (µg/l)
## PROSPECTOR SQUARE, PARK CITY, UTAH
## CASE 9054/3671-H

| SAMPLE # | PS-MW-1D | PS-MW-2S | PS-MW-2D | PS-MW-3 | PS-MW-4 |
|---|---|---|---|---|---|
| TRAFFIC # | MHL-424 | MHL-426 | MHL-423 | MHL-427 | MHL-429 |
| LOCATION | DEEP W OF SITE | NW BDRY | DEEP SW OF SITE | ONSITE N | ONSITE S |
| Aluminum | 100u | 100u | 100u | 100u | 100u |
| Antimony | 25u | 25u | 25u | 25u | 25u |
| Arsenic | 3u | 3u | 3u | 3u | 3u |
| Barium | [60] | [51] | [53] | [63] | 45u |
| Beryllium | 4u | 4u | 4u | 4u | 4u |
| Cadmium | 0.5u | 1.0e | 0.5u | 0.5u | 0.5u |
| Calcium | 248000je | 220000je | 67500je | 153000je | 220000je |
| Chromium | 9uje | 9uje | 9uje | 9uje | 9uje |
| Cobalt | 9u | 9u | 9u | 9u | 9u |
| Copper | 12u | [20] | [12] | 12u | 26 |
| Iron | 100u | 100u | 100u | 100u | 259 |
| Lead | 2u | [2.3] | [8.2] | [3.2] | 2u |
| Cyanide | 0.01u | 0.01u | 0.01u | 0.01u | 0.01u |
| Magnesium | 47600je | 42100je | 18100je | 29500je | 38200je |
| Manganese | [14]je | 80je | 8uje | 8uje | 2750je |
| Mercury | 0.2jr | 0.4jr | 0.2ujr | 0.4jr | 0.2ujr |
| Nickel | [13] | 7u | 7u | 7u | [9.5] |
| Potassium | [2500] | [2200] | [1000] | [2300] | 6600 |
| Selenium | 2u | 2u | 2u | 2u | 2uj* |
| Silver | 8u | 8u | 8u | 8u | 8u |
| Sodium | 83600je | 48000je | 9370je | 104000je | 71400je |
| Thallium | 7u | 7u | 7u | 70u | 7u |
| Vanadium | [20] | [17] | 10u | [12] | [21] |
| Zinc | 20u | 20u | 20u | 20u | 361 |

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.
u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.
uj - Detection limit is estimated because quality control criteria were not met.
j - The associated numerical value is an estimated quantity because the amount detected is below the required limits or because quality control criteria were not met.
r - Quality control indicates that data is <u>not</u> usable (compound may or may not be present). Resampling and reanalysis <u>is</u> necessary for verification.
je - Indicates a value estimated or nor reported due to presence of interference. (Used when serial dilutions results are not within required limits).
jr - Indicates spike recovery is not within control limits. Indicates the value reported is an estimation.
j* - Indicates duplicate analysis is not within control limits. Indicates the value reported is an estimation.
e - (itself) indicates a value estimated due to the presence of interference (low spike recovery during AA analysis).

TABLE 1
INORGANIC ANALYTICAL RESULTS, GROUND AND DRAIN WATERS (μg/l)
PROSPECTOR SQUARE, PARK CITY, UTAH
CASE 9054/3671-H

| SAMPLE # | PS-MW-5S | PS-MW-5D | PS-MW-6 | PS-MW-7S | PS-MW-7D | PS-MW-8 |
|---|---|---|---|---|---|---|
| TRAFFIC # | MHL-435 | MHL-436 | MHL-430 | MHL-431 | MHL-432 | MHL-428 |
| LOCATION | ONSITE | ONSITE | ONSITE | ONSITE | ONSITE | ONSITE |
| Aluminum | 100u | 100u | 100u | [150] | 100u | 100u |
| Antimony | 25u | 25u | 25u | 25u | 25u | 25u |
| Arsenic | 3u | 3u | 3u | 3u | 3u | 3u |
| Barium | 45u | [78] | 45u | [88] | 45u | 45u |
| Beryllium | 4u | 4u | 4u | 4u | 4u | 4u |
| Cadmium | 0.5u | 0.5u | 5.4 | 24 | 0.5u | 45 |
| Calcium | 199000je | 108000je | 198000je | 220000je | 41800je | 183000je |
| Chromium | 9uje | 9u | 9uje | 9uje | 9uje | 9uje |
| Cobalt | 9u | 9u | 9u | 9uje | 9u | 9u |
| Copper | 12u | 12u | [14] | [14] | 12u | [19] |
| Iron | 100u | 100u | 100u | 151 | 100u | 100u |
| Lead | 10 | [3] | [2.6] | 12 | [3.4] | [2.9] |
| Cyanide | 0.01u | 0.01u | 0.01u | 0.01u | 0.01u | 0.01u |
| Magnesium | 36500je | 25900je | 27300je | 27400je | 11000je | 26100je |
| Manganese | 107je | 487je | 80je | 29je | 162je | 114je |
| Mercury | 0.4jr | 0.2jr | 0.3jr | 0.4jr | 0.2ujr | 0.3jr |
| Nickel | 7u | 7u | 7u | [7.7] | 7u | 7u |
| Potassium | [2300] | [1400] | [30000] | 5100 | 500u | 5800 |
| Selenium | 20u | 2u | 2u | 2u | 2u | 2u |
| Silver | 8u | 8u | 8u | 8u | 8u | 8u |
| Sodium | 40800je | 15000je | 33800je | 46600je | 10300je | 37400je |
| Thallium | 7u | 7u | 7u | 7u | 7u | 7u |
| Vanadium | [13] | 10u | [14] | [15] | 10u | [13] |
| Zinc | 74 | 20u | 1060 | 2180 | 20u | 2160 |

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.
u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.
uj - Detection limit is estimated because quality control criteria were not met.
j - The associated numerical value is an estimated quantity because the amount detected is below the required limits or because quality control criteria were not met.
r - Quality control indicates that data is not usable (compound may or may not be present). Resampling and reanalysis is necessary for verification.
je - Indicates a value estimated or nor reported due to presence of interference. (Used when serial dilutions results are not within required limits).
jr - Indicates spike recovery is not within control limits. Indicates the value reported is an estimation.
j* - Indicates duplicate analysis is not within control limits. Indicates the value reported is an estimation.
e - (itself) indicates a value estimated due to the presence of interference (low spike recovery during AA analysis).

TABLE 1
INORGANIC ANALYTICAL RESULTS, GROUND AND DRAIN WATERS (µg/l)
PROSPECTOR SQUARE, PARK CITY, UTAH
CASE 9054/3671-H

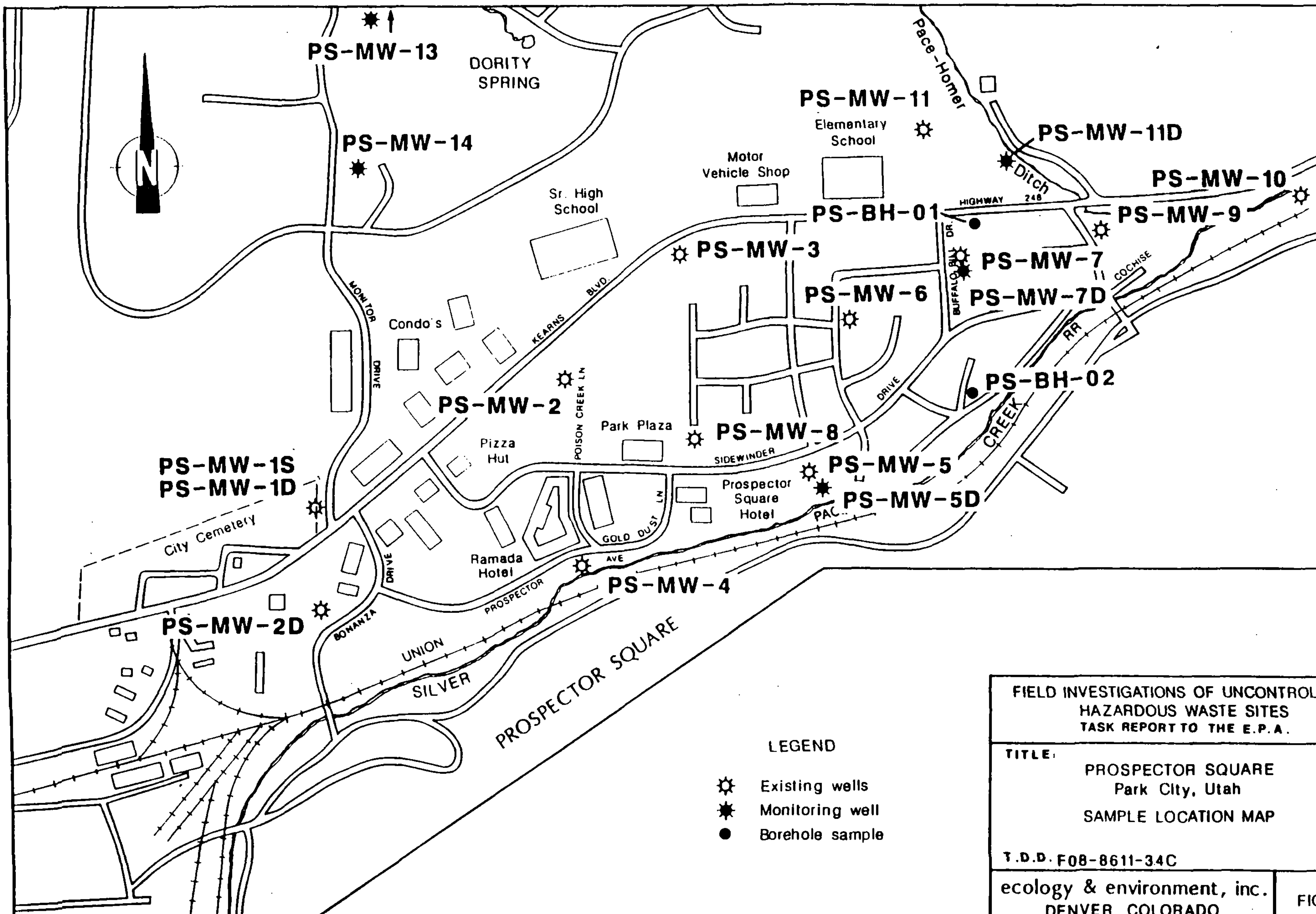
| SAMPLE # | PS-MW-9 | PS-MW-10 | PS-MW-11S | PS-MW-11D | PS-MW-13 | PS-MW-14 |
|---|---|---|---|---|---|---|
| TRAFFIC # | MHL-433 | MHL-441 | MHL-437 | MHL-438 | MHL-422 | MHL-425 |
| LOCATION | ONSITE E | E OF SITE | N OF SITE | NE OF SITE | N OF SITE | N OF SITE |
| Aluminum | 100u | 100u | 100u | 100u | 641 | 100u |
| Antimony | 25u | 25u | 25u | 25u | 25u | 25u |
| Arsenic | 3u | 9.0 | 3u | 3u | 3u | 3u |
| Barium | 45u | [88] | 45u | [48] | [62] | [84] |
| Beryllium | 4u | 4u | 4u | 4u | 4u | 4u |
| Cadmium | 28e | 8.9e | 1.2e | 1.5e | 0.5u | 0.5u |
| Calcium | 173000je | 113000je | 188000je | 88800je | 256000je | 229000je |
| Chromium | 9uje | 9uje | 9uje | 9uje | 72je | 88je |
| Cobalt | 9u | 9u | 9u | 9u | 9u | 9u |
| Copper | 12u | [22] | [13] | 12u | 12u | [20] |
| Iron | 595 | 100u | 115 | 100u | 100u | 100u |
| Lead | 6.3 | 20 | [2.9] | 11 | 5 | 8.5s |
| Cyanide | 0.01u | 0.01u | 11 | 0.01u | 0.01u | 0.01u |
| Magnesium | 29100je | 32800je | 34800je | 22800je | 377uje | 377uje |
| Manganese | 889je | 389je | 141je | 482je | 8uje | 8uje |
| Mercury | 0.3jr | 0.2jr | 0.3jr | 0.2jr | 0.2jr | 0.2jr |
| Nickel | 7u | 7u | 7u | 7u | 7u | [13] |
| Potassium | [1900] | [1200] | [1300] | [1200] | 5400 | 6100 |
| Selenium | 2u | 2u | 2u | 2u | 2u | 2u |
| Silver | 8u | 8u | 8u | 8u | 8u | 8u |
| Sodium | 47400je | 33800je | 27900je | 14700je | 13100je | 29100je |
| Thallium | 7u | 7u | 7u | 7u | 7 u | 7u |
| Vanadium | [13] | [11] | [137] | 10u | [13] | [11] |
| Zinc | 20u | 614 | 20u | 20u | 20u | 20u |

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.
u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.
uj - Detection limit is estimated because quality control criteria were not met.
j - The associated numerical value is an estimated quantity because the amount detected is below the required limits or because quality control criteria were not met.
r - Quality control indicates that data is <u>not</u> usable (compound may or may not be present). Resampling and reanalysis is necessary for verification.
je - Indicates a value estimated or nor reported due to presence of interference. (Used when serial dilutions results are not within required limits).
jr - Indicates spike recovery is not within control limits. Indicates the value reported is an estimation.
j* - Indicates duplicate analysis is not within control limits. Indicates the value reported is an estimation.
e - (itself) indicates a value estimated due to the presence of interference (low spike recovery during AA analysis).

TABLE 1
INORGANIC ANALYTICAL RESULTS, GROUND AND DRAIN WATERS (µg/l)
PROSPECTOR SQUARE, PARK CITY, UTAH
CASE 9054/3671-H

| SAMPLE # | PS-MW-16 MHL-439 | PS-MW-17 MHL-440 | PS-MW-19 | PS-SW-1 |
|---|---|---|---|---|
| TRAFFIC # | MW-11D | RINSATE | MHL-442 | MHL-434 |
| LOCATION | DUPLICATE | BLANK | PE | DRAIN E OF PARK |
| Aluminum | 100u | 100u | 100u | 100u |
| Antimony | 25u | 25u | 25u | 25u |
| Arsenic | 3u | 3u | 8.2 | 5.2 |
| Barium | [48] | 45u | 45u | 45u |
| Beryllium | 4u | 4u | 9.4 | 4u |
| Cadmium | 0.5u | 2.4 | 2.4 | 24 |
| Calcium | 87900je | 718je | 718u | 197000je |
| Chromium | 9uje | 9uje | [9.5]je | 9uje |
| Cobalt | 9u | 9u | [9.2]je | 9u |
| Copper | [19] | 12u | [20] | [16] |
| Iron | 100u | 100u | 100u | 491 |
| Lead | [4.5] | 5.6a | 13 | 11 |
| Cyanide | 0.01u | 0.01u | 0.01u | 0.01u |
| Magnesium | 22600je | 277uje | 377uje | 28700je |
| Manganese | 478je | 8uje | 8uje | 875je |
| Mercury | 0.8jr | 0.8jr | 0.75njr | 0.3jr |
| Nickel | [7.4] | 7u | 7u | 7u |
| Potassium | [1200] | 500u | 500u | [4000] |
| Selenium | 2u | 2u | 2u | 2u |
| Silver | 8u | 8u | 8u | 8u |
| Sodium | 14400je | 11660je | 1166uje | 66300je |
| Thallium | 7u | 7u | 7u | 7u |
| Vanadium | 10u | 10u | [16] | [17] |
| Zinc | 20u | 20u | 20u | 2050 |

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.
u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.
uj - Detection limit is estimated because quality control criteria were not met.
j - The associated numerical value is an estimated quantity because the amount detected is below the required limits or because quality control criteria were not met.
r - Quality control indicates that data is not usable (compound may or may not be present). Resampling and reanalysis is necessary for verification.
je - Indicates a value estimated or nor reported due to presence of interference. (Used when serial dilutions results are not within required limits).
jr - Indicates spike recovery is not within control limits. Indicates the value reported is an estimation.
j* - Indicates duplicate analysis is not within control limits. Indicates the value reported is an estimation.
e - (itself) indicates a value estimated due to the presence of interference (low spike recovery during AA analysis).




| FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES<br>TASK REPORT TO THE E.P.A. | |
|---|---|
| TITLE: PROSPECTOR SQUARE<br>Park City, Utah<br>SAMPLE LOCATION MAP | |
| T.D.D. F08-8611-34C | |
| ecology & environment, inc.<br>DENVER, COLORADO | FIG. 2 |
| Date: 10/87 Drawn by: RSM Scale: 1" - 665' | |

SAMPLING ROUND IV

U.S. ENVIRONMENTAL PROTECTION AGENCY
GROUNDWATER DATA

EPA-GW-IV

**DRAFT**

PROSPECTOR SQUARE
PARK CITY, UTAH
GROUND WATER ANALYTICAL RESULTS
FOURTH ROUND SAMPLING
APRIL, 1988
µg/l
CASE #9286/3757H

| SAMPLE NUMBER | PS-MW-1S | PS-MW-1D | PS-MW-2D | PS-MW-2 | PS-MW-3 |
|---|---|---|---|---|---|
| TRAFFIC NUMBER | MHL-601 | MHL-606 | MHL-607 | MHL-608 | MHL-616 |
| LOCATION | BACKGROUND | BACKGROUND | BACKGROUND | ONSITE | ONSITE |
| Aluminum | 100u | 100u | 100u | 100u | 100u |
| Antimony | 17u | 17u | 17u | 17u | 17u |
| Arsenic | 2u | 2u | 2.7u | 2u | 2u |
| Barium | [98] | 390jr | [57] | [54] | [70] |
| Beryllium | 2u | 2u | 2u | 2u | 2u |
| Cadmium | 1.1u | 1.1u | 1.1u | 1.1u | 1.1u |
| Calcium | 294,000 | 230,000 | 65,800 | 210,000 | 157,000 |
| Chromium | 4u | 4u | 4u | 4u | [4.5] |
| Cobalt | 6u | 6u | 6u | 6u | 6u |
| Copper | [16] | [12] | [10] | [11] | 34 |
| Cyanide | 10u | 10u | 10u | 10u | 10u |
| Iron | 100u | 138jr | 192jr | 100u | 100u |
| Lead | 30u | 3u | 6.5jr | 3u | 3u |
| Magnesium | 51,800 | 44,500 | 18,200 | 40,300 | 31,300 |
| Manganese | 28 | [14] | 7u | [7.3] | [7.8] |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u |
| Nickel | 11u | 11u | 11u | 11u | 11u |
| Potassium | [3500] | [1600] | [500] | [1400] | [1600] |
| Selenium | 2u | 2u | 2u | 2u | 2u |
| Silver | 5u | 15jr | 5u | 5u | 5u |
| Sodium | 25,100 | 80,200 | 9,300 | 48,600 | 10,300 |
| Thallium | 70u | 7u | 7u | 7u | 7u |
| Vanadium | 4u | 4u | 4u | 4u | 4u |
| Zinc | [14] | 48jr | [9.1] | 7u | 9.1jr |
| Alkalinity | 135 | 102 | 110 | 112 | 142 |
| Chloride | 860 | 437 | 40 | 332 | 292 |
| Sulfate | 260 | 238 | 780 | 226 | 490 |

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

jr - Indicates spike recovery is not within control limits. Indicates the value reported is an estimation.

**DRAFT**

PROSPECTOR SQUARE
PARK CITY, UTAH
GROUND WATER ANALYTICAL RESULTS
FOURTH ROUND SAMPLING
APRIL, 1988
µg/l
CASE #9286/3757H

| SAMPLE NUMBER | PS-MW-4 | PS-MW-5 | PS-MW-5D | PS-MW-6 | PS-MW-7 | PS-MW-7D |
|---|---|---|---|---|---|---|
| TRAFFIC NUMBER | MHL-609 | MHL-610 | MHL-611 | MHL-615 | MHL-612 | MHL-613 |
| LOCATION | ONSITE | ONSITE | ONSITE | ONSITE | ONSITE | ONSITE |
| Aluminum | 100u | 100u | 100u | 100u | 100u | 100u |
| Antimony | 17u | 17u | 17u | 17u | 17u | 17u |
| Arsenic | 2u | 2u | 2u | 2u | 2u | 2u |
| Barium | [20] | [29] | [61] | [20] | [18] | [39] |
| Beryllium | 2u | 2u | 2u | 2u | 2u | 2u |
| Cadmium | 5.5u | 3.6jr | 1.1u | 5.5u | 5.5u | 1.1u |
| Calcium | 177000 | 165000 | 99800 | 208000 | 216000 | 37200 |
| Chromium | 4u | [5.2] | 4u | [5.1] | 4u | 4u |
| Cobalt | 6u | 6u | 6u | 6u | 6u | 6u |
| Copper | [12] | [12] | [14] | [18] | [14] | 9u |
| Cyanide | 18 | 16 | 10u | 10u | 10u | 10u |
| Iron | 100u | 121jr | 100u | 100u | 100u | 100u |
| Lead | 3u | 3u | 3u | 3u | 3u | 5.4jr |
| Magnesium | 30,700 | 29,300 | 24,000 | 29500 | 27200 | 10000 |
| Manganese | 44 | 47 | 82 | 63 | [14] | 383 |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u |
| Nickel | 11u | [13] | 11u | 11u | 11u | 11u |
| Potassium | 5300 | [2500] | [700] | [2900] | [3500] | 500u |
| Selenium | 2u | 2u | 2u | 2u | 2u | 2u |
| Silver | 5u | 5u | 5u | 5u | 5u | 5u |
| Sodium | 50,900 | 46,000 | 14,200 | 38,500 | 47,200 | 9420 |
| Thallium | 7u | 7u | 7u | 7u | 7u | 7u |
| Vanadium | 4u | 4u | 4u | 4u | 4u | 4u |
| Zinc | 2290jr | 1780jr | [8.8] | 1540jr | 2030jr | [8.1] |
| Alkalinity | 55.0 | 58.0 | 108 | 50 | 608 | 115 |
| Chloride | 145 | 125 | 36.0 | 112 | 112 | 120 |
| Sulfate | 225 | 484 | 258 | 990 | 212 | 31 |

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

jr - Indicates spike recovery is not within control limits. Indicates the value reported is an estimation.

**DRAFT**

PROSPECTOR SQUARE
PARK CITY, UTAH
GROUND WATER ANALYTICAL RESULTS
FOURTH ROUND SAMPLING
APRIL, 1988
µg/l
CASE #9286/3757H

| SAMPLE NUMBER | PS-MW-8 | PS-MW-9 | PS-MW-10 | PS-MW-11 | PS-MW-11D |
|---|---|---|---|---|---|
| TRAFFIC NUMBER | MHL-614 | MHL-621 | MHL-624 | MHL-629 | MHL-630 |
| LOCATION | ONSITE | DNGRDNT | DNGRDNT | DNGRDNT | DNGRDNT |
| Aluminum | 100u | 100u | 100u | 100u | 100u |
| Antimony | 17u | 17u | 17u | 17u | 17u |
| Arsenic | 2u | 2.4 | [9.6] | 2u | 2.6 |
| Barium | [20] | [40] | [88] | 717jr | [56] |
| Beryllium | 2u | 2u | 2u | 2u | 2u |
| Cadmium | 20jr | 1.1u | 5.0jr | 1.1u | 1.1u |
| Calcium | 93,000 | 200,000 | 141,000 | 165,000 | 81,000 |
| Chromium | 4u | 4u | [4.1] | 4u | 4u |
| Cobalt | 6u | 6u | 6u | 6u | 6u |
| Copper | [15] | [23] | [22] | 25 | 29 |
| Cyanide | 14 | 10u | 10u | 10u | 10u |
| Iron | 100u | 918jr | 114jr | 100u | 118jr |
| Lead | 3u | 3u | 31jr | 3u | 3.1jr |
| Magnesium | 27900 | 33600 | 38800 | 30200 | 20900 |
| Manganese | 115 | 1110 | 1220 | 118 | 244 |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u |
| Nickel | 11u | 11u | 11u | 11u | 11u |
| Potassium | [4800] | [1600] | [1300] | [500] | 500u |
| Selenium | 2u | 2u | 2u | 2u | 2u |
| Silver | [6.7] | 5u | 5u | 5u | 5u |
| Sodium | 42900 | 59000 | 40900 | 24200 | 13900 |
| Thallium | 7u | 7u | 7u | 7u | 7u |
| Vanadium | 4u | 4u | 4u | 4u | 4u |
| Zinc | 2780jr | [16] | 1930jr | 38jr | [13] |
| Alkalinity | 50.0 | 195 | 215 | 160 | 652 |
| Chloride | 170 | 207 | 95 | 167 | 35 |
| Sulfate | 512 | 189 | 251 | 244 | 122 |

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

jr - Indicates spike recovery is not within control limits. Indicates the value reported is an estimation.

DRAFT

PROSPECTOR SQUARE
PARK CITY, UTAH
GROUND WATER ANALYTICAL RESULTS
FOURTH ROUND SAMPLING
APRIL, 1988
µg/l
CASE #9286/3757H

| SAMPLE NUMBER | PS-MW-13 | PS-MW-13 | PS-DR-1 | PS-TB-1 |
|---|---|---|---|---|
| TRAFFIC NUMBER | MHL-632 | MHL-631 | MHL-620 | MHL-602 |
| LOCATION | FIELD BLANK | DUPLICATE | DOWNGRADIENT | TRIP BLANK |
| Aluminum | 100u | 100u | 100u | 100u |
| Antimony | 17u | 17u | 17u | 17u |
| Arsenic | 2u | 2u | 2u | 2u |
| Barium | 5u | [51] | [16] | 334jr |
| Beryllium | 2u | 2u | 2u | 2u |
| Cadmium | 11u | 1.1u | 12jr | 1.1u |
| Calcium | 500u | 85800 | 215000 | 500u |
| Chromium | 4u | 4u | [5.0] | 4u |
| Cobalt | 6u | 6u | 6u | 6u |
| Copper | [9.5] | [21] | [19] | [14] |
| Cyanide | 10u | 10u | 10u | NR |
| Iron | 100u | 100u | 287 | 100u |
| Lead | 3.1jr | 3.5jr | 4.4jr | 3u |
| Magnesium | 500u | 22200 | 32,600 | 500u |
| Manganese | 7u | 259 | 531 | 7u |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u |
| Nickel | 11u | 11u | 11u | 11u |
| Potassium | 500u | 500u | [3400] | 500u |
| Selenium | 2u | 2u | 2u | 2u |
| Silver | 5u | 5u | 5u | 5u |
| Sodium | [692] | 14700 | 47300 | 597u |
| Thallium | 7u | 7u | 7u | 7u |
| Vanadium | 4u | 4u | 4u | 4u |
| Zinc | [9.4] | [9.4] | 2860jr | 7u |
| Alkalinity | 2u | 155 | 80.0 | NR |
| Chloride | 9.50 | 39 | 197 | NR |
| Sulfate | 10u | 122 | 522 | NR |

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

jr - Indicates spike recovery is not within control limits. Indicates the value reported is an estimation.

NR - Compound not analyzed for.

SAMPLING ROUND I

U.S. ENVIRONMENTAL PROTECTION AGENCY
SURFACE WATER DATA

EPA-SW-I

DRAFT

TABLE 1
PROSPECTOR SQUARE
INORGANIC ANALYSIS FOR SURFACE WATER SAMPLES
PARK CITY, UTAH (ug/l total)
APRIL 29, 1987

| SAMPLE # | PS-SW-1 | PS-SW-2 | PS-SW-3 | PS-SW-4 | PS-SW-5 | PS-SW-6 |
|---|---|---|---|---|---|---|
| TRAFFIC # | MHG-651 | MHG-646 | MHG-653 | MHG-781 | MHG-654 | MHG-649 |
| LOCATION | UPGRDNT | UPGRDNT | UPGRDNT | DNGRDNT | DNGRDNT | DUPLICATE |
| Aluminum | 140u | 140u | 1360 | 1370 | 420 | 140u |
| Antimony | 60u | 60u | 60u | 60u | 60u | 60u |
| Arsenic | 10 | 10u | 27 | 17 | 12 | 10u |
| Barium | 70u | 70u | [80] | 70u | 70u | 70u |
| Beryllium | 3u | 3u | 3u | 3u | 3u | 3u |
| Cadmium | 4u | 4u | 4u | 4u | 4u | 4u |
| Calcium | 95,700 | 105,000 | 76,900 | 78,200 | 120,000 | 104,000 |
| Chromium | 10u | 10u | 10u | 10u | 10u | 10u |
| Cobalt | 30u | 30u | 30u | 30u | 30u | 30u |
| Copper | 11u | [20] | 54 | 40 | 26 | [19] |
| Iron | 120 | 60u | 2350 | 1860 | 810 | 60u |
| Lead | 5u | 24b | 580 | 330 | 166 | 17 |
| Cyanide | 10u | 10u | 10u | 10u | -- | 10u |
| Magnesium | 31,100 | 29,800 | 16,200 | 15,700 | 26,600 | 29,500 |
| Manganese | 129 | 63 | 278 | 309 | 382 | 65 |
| Mercury | .2u | .2u | .2u | .2u | .2u | .2u |
| Nickel | 24u | 24 | 24u | 24u | 24u | 24u |
| Potassium | [1900] | [1700] | [3200] | [3300] | [2400] | [1800] |
| Selenium | 5ur | 5ur | 5ur | 5ur | 5ur | 5ur |
| Sodium | 17,500 | 22,800 | 97,000 | 563,000 | 47,000 | 23,300 |
| Silver | 92 | 119 | 91*r | 10ur | 103 | 116*r |
| Thallium | 10ur | 10ur | 10ur | 10ur | 10ur | 10ur |
| Tin | 50 | 40u | 40ur | 40u | 40u | 40u |
| Vanadium | 20u | 20u | 20ur | 20u | 20u | 20u |
| Zinc | 29 | 73 | 871 | 525 | 755 | 50 |

nr - Not required by contract at this time.
u - Indicates element was analyzed for but not detected.
r - Data is unusable due to spike recovery values.
* - Indicates duplicate analysis is not within control limits.
[] - Element was identified in the sample, but concentration is les than CRDL.
b - Compound was detected in the blank. Quantity reported is >5x the amount found in the blank.

DRAFT

TABLE 2
PROSPECTOR SQUARE
INORGANIC ANALYSIS FOR SURFACE WATER SAMPLES
PARK CITY, UTAH (ug/l dissolved)
APRIL 29, 1987

| SAMPLE # | PS-SW-1 | PS-SW-2 | PS-SW-3 | PS-SW-4 | PS-SW-5 | PS-SW-6 | PS-SW-7 |
|---|---|---|---|---|---|---|---|
| TRAFFIC # | MHG-657 | MHG-658 | MHG-644 | MHG-652 | MHG-779 | MHG-655 | MHG-650 |
| LOCATION | UPGRDNT | UPGRDNT | UPGRDNT | DNGRDNT | DNGRDNT | DUPLICATE | BLANK |
| Aluminum | 140u | 140u | 140u | 140u | 140u | 140u | 140u |
| Antimony | 60u | 60u | 60u | 60u | 60u | 60u | 60u |
| Arsenic | 10u | 10u | 10u | 10u | 10u | 10u | 10u |
| Barium | 70u | 70u | 70u | [80] | 70u | 70u | 70u |
| Beryllium | 3u | 3u | 3u | 3u | 3u | 3u | 3u |
| Cadmium | 4u | 4u | 4u | 4u | 4u | 4u | 4u |
| Calcium | 94,200 | 107,000 | 78,400 | 83,000 | 123,000 | 104,000 | 1900u |
| Chromium | 10u | 10u | 10u | 10u | 10u | 10u | 10u |
| Cobalt | 30u | 30u | 20u | 30u | 30u | 30u | 30u |
| Copper | 11u | [13] | 30 | [23] | [16] | [14] | [18] |
| Iron | 60u | 110 | 60u | 60u | 60u | 120 | 60u |
| Lead | 5u | 27s | 7 | 9 | 8 | 27 | 5u |
| Magnesium | 29,800 | 30,500 | 5,500 | 17,100 | 27,200 | 29,300 | 1400u |
| Manganese | 158 | 72 | 122 | 259 | 353 | 73 | 11u |
| Mercury | .2u | .2u | .4u | .2u | .2u | .2 | .2u |
| Nickel | 24u | 24u | 24u | 24u | 24u | 24u | 24u |
| Potassium | [1800] | [1700] | [8000] | [2700] | [2400] | [1800] | [1400]u |
| Selenium | 5ur | 5ur | 5ur | 5ur | 5ur | 5ur | 5ur |
| Sodium | 17,300 | 23,300 | 95,800 | 106,000 | 46,700 | 25,100 | 1500u |
| Silver | 99*r | 10ur* | 117 | 95*r | 10ur | 107*r | 116r |
| Thallium | 10ur | 10ur | 10ur | 10ur | 10ur | 10ur | 10ur |
| Tin | 40u | 40u | 40u | 40u | 40u | 40u | 40u |
| Vanadium | 20u | 20u | 20u | 20u | 20u | 20u | 20u |
| Zinc | 32 | 63 | 62 | 68 | 559 | 76 | 15u |

u - Indicates element was analyzed for but not detected.
r - Data is unusable, due to spike recovery.
* - Indicates duplicate analysis is not within control limits.
[] - Element was identified in the sample, but concentration is less than CRDL.
s - Indicates value determined by method of standard addition.

DRAFT

TABLE 3
PROSPECTOR SQUARE
INORGANIC ANALYSIS FOR SEDIMENT SAMPLES
PARK CITY, UTAH (mg/kg)
APRIL 29, 1987

| | PS-SE-1 NOT TAKEN | PS-SE-2 MHG-647 UPGRDNT | PS-SE-3 MHG-645 UPGRDNT | PS-SE-4 MHG-782 LATERAL | PS-SE-5 MHG-780 DNGRDNT | PS-SE-6 MHG-648 DUPLICATE |
|---|---|---|---|---|---|---|
| Aluminum | | 20,000 | 22,300 | 25,00 | 17,500 | 20,800 |
| Antimony | | 105ur | 77r | 130r | 154r | 72ur |
| Arsenic | | 159 | 2173 | 229 | 256 | 94 |
| Barium | | [77]r | 263r | [200]r | 213r | [169]r |
| Beryllium | | 5.3ur | 2.3ur | 3.5ur | 2.6ur | |
| Cadmium | | 23r | 43r | 33r | 45r | 17r |
| Calcium | | 36,800 | 86,600 | 26,300 | 30,600 | 27,900 |
| Chromium | | 44r | 186r | 52r | 50r | 39r |
| Cobalt | | 53ur | 23ur | 35ur | 26ur | 36ur |
| Copper | | 293r | 280r | 191r | 343r | 167r |
| Iron | | 24,500 | 54,500 | 30,600 | 36,400 | 25,500 |
| Lead | | 3786 | 5900 | 3910 | 5960 | 2440 |
| Cyanide | | nr | nr | nr | nr | nr |
| Magnesium | | 9,900 | 27,500 | 14,500 | 10,900 | 9780 |
| Manganese | | 1430r | 5020r | 1430r | 1570r | 1790 |
| Mercury | | 1.1 | 16 | 24 | 8.5 | .73 |
| Nickel | | 42u | 19u | 28ur | 20u | 29u |
| Potassium | | [3180] | 4870 | [4950] | [3160] | [4590] |
| Selenium | | 8.8u | 13 | 5.9u | 6.85 | 6u |
| Sodium | | 2650u | 1160u | 1770u | 1280u | 1810u |
| Silver | | 18u | 18 | 28r | 31r | 12u |
| Thallium | | 18u | 7.7u | 12u | 8.5u | 12u |
| Tin | | 71ur | 31ur | 47ur | 34ur | 48ur |
| Vanadium | | 35ur | 262r | [48]r | [38]r | [36]r |
| Zinc | | 4710 | 7390 | 6130 | 8320 | 3670 |
| % Solids | | 28% | 64% | 42% | 58% | 41% |

nr - Not required by contract at this time.
u - Indicates element was analyzed for but not detected.
r - Data is unusable due to spike recovery.
[] - Element was identified in the sample, but concentration is less than CRDL.
* - Indicates duplicate analysis is not within control limits.

SAMPLING ROUND II

U.S. ENVIRONMENTAL PROTECTION AGENCY
SURFACE WATER DATA

EPA-SW-II



DRAFT COPY

PROSPECTOR SQUARE
PARK CITY, UTAH
SECOND ROUND SURFACE WATER DATA
JULY, 1987
(ug/l)

| SAMPLE NUMBER<br>TRAFFIC NUMBER<br>TYPE | PS-SW-1<br>MBG-693<br>TOTAL | PS-SW-1<br>MBG-694<br>DSSLVD | PS-SW-2<br>MBG-695<br>TOTAL | PS-SW-2<br>MBG-697<br>DSSLVD | PS-SW-3<br>MBG-656<br>TOTAL | PS-SW-3<br>MBG-686<br>DSSLVD |
|---|---|---|---|---|---|---|
| Aluminum | [71] | [16] | [32] | [20] | [60] | [32] |
| Antimony | 25u | 25u | 25u | 25u | 25u | 25u |
| Arsenic | 18 | 17 | 12 | 11 | 10u | 10u |
| Barium | [22] | [22] | [30] | [28] | [51] | [49] |
| Beryllium | 1u | 1u | 1u | 1u | 1u | 1u |
| Cadmium | 4u | 4u | 4u | 4u | 4u | 4u |
| Calcium | 118,000 | 120,000 | 120,000 | 120,000 | 78,900 | 79,400 |
| Chromium | 4u | 4u | 4u | 4u | 4u | 4u |
| Cobalt | 9u | 9u | 9u | 9u | 9u | 9u |
| Copper | 56 | 28 | [16] | [11] | [11] | [6.1] |
| Cyanide | 10u | NR | 10u | NR | 10u | NR |
| Iron | [90] | 24u | [65] | 24u | 192 | [29] |
| Lead | 5u | 5u | 13 | 14 | 42 | 5u |
| Magnesium | 35,400 | 36,300 | 33,200 | 33,800 | 17,200 | 17,300 |
| Manganese | 86 | 60 | 33 | 23 | 28 | 18 |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u |
| Nickel | 8u | 8u | 8u | 8u | 8u | 8u |
| Potassium | [1930] | [1850] | [1760] | [1900] | [3010] | [3180] |
| Selenium | 5u | 5u | 5u | 5u | 5u | 5u |
| Silver | 4u | 4u | 4u | 4u | 4u | 4u |
| Sodium | 9400 | 8780 | 16,100 | 16,800 | 76,400 | 76,500 |
| Thallium | 10u | 10u | 10u | 10u | 10u | 10u |
| Tin | 22u | 22u | 22u | 22u | 22u | 22u |
| Vanadium | 7u | 7u | 7u | 7u | 7u | 7u |
| Zinc | 23 | [16] | 28 | 23 | 77 | 38 |

u – The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.
[] – Indicated concentration detected at less than contract required detection limits.
NR – Not analyzed for.

DRAFT COPY

PROSPECTOR SQUARE
PARK CITY, UTAH
SECOND ROUND SURFACE WATER DATA
JULY, 1987
(ug/l)

| SAMPLE NUMBER<br>TRAFFIC NUMBER | PS-SW-4<br>MBG-688<br>DSSLVD | PS-SW-4<br>MBG-687<br>TOTAL | PS-SW-5<br>MBG-689<br>TOTAL | PS-SW-5<br>MBG-690<br>DSSLVD | PS-SW-6<br>MBG-869<br>DSSLVD | PS-SW-6<br>MBG-868<br>TOTAL |
|---|---|---|---|---|---|---|
| Aluminum | [17] | [21] | [198] | [26] | [19] | [22] |
| Antimony | 25u | 25u | 25u | [25] | 25u | 25u |
| Arsenic | 10u | 10u | 12 | 10u | 11 | 12 |
| Barium | [60] | [57] | [46] | [46] | [29] | [30] |
| Beryllium | 1u | 1u | 1u | 1u | 1u | 1u |
| Cadmium | 17 | 12 | 7.1 | 6 | 4u | 4u |
| Calcium | 238,000 | 236,000 | 225,000 | 218,000 | 120,000 | 119,000 |
| Chromium | 4u | 4u | 4u | 4u | 4u | 4u |
| Cobalt | 9u | 9u | 9u | 9u | 9u | 9u |
| Copper | [10] | [7.1] | [16] | 6u | [11] | [18] |
| Cyanide | NR | 10u | 10u | NR | NR | 10u |
| Iron | [27] | [94] | 759 | [80] | [29] | [73] |
| Lead | 50u | 50u | 161 | 6.2 | 5u | 13 |
| Magnesium | 63,100 | 62,400 | 34,700 | 34,400 | 33,600 | 33,300 |
| Manganese | 2970 | 2860 | 1050 | 980 | 23 | 31 |
| Mercury | 0.2u | 0.4u | 0.3 | 0.2u | 0.2u | 0.2u |
| Nickel | [8.5] | 8u | [8.6] | 8u | 8u | 8u |
| Potassium | [4240] | [4200] | [3980] | [3800] | [1790] | [1790] |
| Selenium | 50u | 50u | 5u | 5u | 5u | 5u |
| Silver | 4u | [4.2] | [4] | 4u | 4u | 4u |
| Sodium | 40,600 | 39,800 | 49,400 | 48,000 | 16,800 | 16,200 |
| Thallium | 10u | 10u | 10u | 10u | 10u | 10u |
| Tin | 22u | 22u | 22u | 22u | 22u | 22u |
| Vanadium | 7u | 7u | 7u | 7u | 7u | 7u |
| Zinc | 3500 | 3410 | 2610 | 2380 | 24 | 26 |

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

[] - Indicated concentration detected at less than contract required detection limits.

NR - Not analyzed for.

# PROSPECTOR SQUARE
# PARK CITY, UTAH
# SECOND ROUND, SEDIMENT DATA
# JULY, 1987
# mg/kg

| SAMPLE NUMBER<br>TRAFFIC NUMBER<br>LOCATION | PS-SE-2<br>MHG-871<br>P/H DITCH | PS-SE-3<br>MHG-872<br>UPGRDNT | PS-SE-4<br>MHG-873<br>DNGRDNT | PS-SE-5<br>MHG-874<br>DNGRDNT | PS-SE-6<br>MHG-875<br>DUP SE-2 |
|---|---|---|---|---|---|
| Aluminum | 3540 | 43400 | 9640 | 3730 | 3320 |
| Antimony | [38] | 366 | 20uj | 184 | [34] |
| Arsenic | 54 | 514 | 25 | 385 | 47 |
| Barium | [58] | [682] | [93] | [96] | [44] |
| Beryllium | 0.85u | [4] | [0.9] | 0.77u | 0.98u |
| Cadmium | 14 | 123 | 14 | 63 | 11 |
| Calcium | 12,000 | 158,000 | 9260 | 27500 | 9080 |
| Chromium | 8.7j | 115j | 15j | 14j | [5.3]j |
| Cobalt | 7.6u | [38] | [9.7] | 6.9u | 8.8u |
| Copper | 154 | 1200 | 58 | 400 | 117 |
| Iron | 6370 | 86300 | 13000 | 24000 | 5240 |
| Lead | 1640 | 19300 | 670 | 5000 | 1270 |
| Magnesium | [2580] | 65000 | [3670] | 8860 | [2440] |
| Manganese | 431 | 4090 | 2050 | 1650 | 523 |
| Mercury | 6.6 | 14j | 1.5j | 7.2j | 8.4j |
| Nickel | [8.8] | [99]j | [17]j | [14] | [8.9]j |
| Potassium | [642] | [8150] | [1520] | [569] | [672] |
| Selenium | 4.2u | 18u | 4u | 38u | 4.9u |
| Silver | 12j | 110 | [5.9]j | 35j | [9.5]j |
| Sodium | 924u | 3890u | 865u | 838uj | 1070uj |
| Thallium | 8.5u | 36u | 7.9u | 7.7u | 9.8u |
| Tin | 19u | 79u | 17uj | 17u | 22u |
| Vanadium | [8.8] | [127] | [23] | [12] | 6.9u |
| Zinc | 2330 | 22900 | 3130 | 12800 | 1660 |
| Cyanide | 0.85uj | 10j | 0.79uj | 0.77u | 0.98u |

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit.

uj - Detection limit is estimated because quality control criteria were not met.

j - The associated numerical value is an estimated quantity because the amount detected is below the required limits or because quality control criteria were not met.

SAMPLING ROUND III

U.S. ENVIRONMENTAL PROTECTION AGENCY
SURFACE WATER DATA

EPA-SW-III

TABLE 1
PROSPECTOR SQUARE
PARK CITY, UTAH
APRIL, 1988
INORGANIC ANALYTICAL RESULTS
SEDIMENT SAMPLING mg/kg
TDD F08-8611-34G
CASE #9245

| SAMPLE NUMBER<br>TRAFFIC REPORT | PS-SE-2<br>MHL-619 | PS-SE-3<br>MHL-628 | PS-SE-4<br>MHL-626 | PS-SE-5<br>MHL-623 |
|---|---|---|---|---|
| Aluminum | 13,800 | 10,600 | 19,900 | 3,780 |
| Antimony | 47.1j | 29.9j | 8.7uj | 120j |
| Arsenic | 143 | 78.4j | 22.9j | 165 |
| Barium | 215 | 164 | 109 | 73.1 |
| Beryllium | [0.87] | [0.73] | [1.1] | 0.28u |
| Cadmium | 28.9 | 23.6 | 3.9 | 96.5 |
| Calcium | 48,500 | 42,900 | 7,650 | 26,300 |
| Chromium | 59.1j | 31.5j | 24.6j | 14.3j |
| Cobalt | [11.7] | [6.9] | [7.5] | [6.0] |
| Cyanide | 1.0uj | 8.9j | 0.75uj | 0.70uj |
| Copper | 435j | 173j | 36.4j | 317j |
| Iron | 30,100 | 21,000 | 25,700 | 23,200 |
| Lead | 3,340 | 2,960 | 164 | 5290 |
| Magnesium | 12,000 | 14,200 | 5,940 | 9550 |
| Manganese | 1500 | 1450 | 294 | 1910 |
| Mercury | 12 | 1.8 | 0.3 | 3.6 |
| Nickel | 19.4 | 15.8 | 18.5 | [10.2] |
| Potassium | 2330 | [1770] | 1920 | [686] |
| Selenium | 8.3uj | 3.6uj | 6.0uj | 2.2j |
| Silver | 22.8j | 15.4j | [2.7]j | 31.6j |
| Sodium | 830u | [737] | [644] | 2600 |
| Thallium | 1.2 | 0.71u | 0.60uj | [0.84]j |
| Vanadium | 64.2 | 37.2 | 41.0 | [12.2] |
| Zinc | 4890 | 3670 | 372 | 19,000 |
| % Solids | 48.2 | 56.0 | 66.7 | 71.4 |

u - The material was analyzed for, but was not detected. The associated numerical value is the contract required detection limit (CRDL).

j - The associated numerical value is an estimated quantity. Presence of the material is reliable.

uj - QC problems indicate a false negative result may exist.

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

TABLE 2
PROSPECTOR SQUARE
PARK CITY, UTAH
APRIL, 1988
INORGANIC RESULTS
SURFACE WATER SAMPLING µg/l
TDD F08-8611-34
CASE #9245

| SAMPLE NUMBER<br>TRAFFIC REPORT | PS-SW-1<br>MHL-617 | PS-SW-2<br>MHL-618 | PS-SW-3<br>MHL-627 | PS-SW-4<br>MHL-625 | PS-SW-5<br>MHL-622 |
|---|---|---|---|---|---|
| Aluminum | 100u | 100u | 100u | 100u | 100u |
| Antimony | 17u | 17u | 17u | 17u | 17u |
| Arsenic | 5.4 | 5.2 | 2.0u | 28 | 5.2 |
| Barium | [46]j | [31]j | 466j | [66]j | [34]j |
| Beryllium | 2uj | 2uj | 2uj | 2uj | 2uj |
| Cadmium | 1.1uj | 1.1j | 1.1uj | 1.1j | 1.1uj |
| Calcium | 77,200 | 91,500 | 71,100 | 69,800 | 97,300 |
| Chromium | 4u | 4u | 4u | 4u | 4u |
| Cobalt | 6u | 6u | 6u | 6u | 6u |
| Copper | [14] | [10] | [23] | [21] | [22] |
| Cyanide | 10u | 10u | 10u | 10u | 19 |
| Iron | 121j | 152j | 100uj | 100uj | 111j |
| Lead | 17j | 11j | 3.5j | 4.2j | 14j |
| Magnesium | 24,900 | 25,600 | 14,400 | 14,200 | 22,400 |
| Manganese | 284 | 106 | 260 | 207 | 165 |
| Mercury | 0.2u | 0.2u | 0.2u | 0.2u | 0.2u |
| Nickel | 11u | 11u | 11u | 11u | 11u |
| Potassium | [1500] | [1200] | [1600] | [1900] | [1900] |
| Selenium | 2u | 2u | 2u | 2u | 2u |
| Silver | 5uj | 5uj | 5uj | 5uj | [5.5]j |
| Sodium | 17500 | 19400 | 112,000 | 110,000 | 54,600 |
| Thallium | 7uj | 7uj | 7uj | 7uj | 7uj |
| Vanadium | 4u | 4u | 4u | 4u | 4u |
| Zinc | [14]j | 50j | 136j | 151j | 260j |
| Chloride | 30 | 49 | 215 | 225 | 135 |
| Sulfate | 130 | 166 | 68 | 77.0 | 184 |
| Alkalinity | 172 | 170 | 102 | 100 | 140 |

u - The material was analyzed for, but was not detected. The associated numerical value is the contract required detection limit (CRDL).

j - The associated numerical value is an estimated quantity. Presence of the material is reliable.

uj - QC problems indicate a false negative result may exist.

[] - Compound is present and was detected. However, the quantity is below the contract required detection limit.

SIIL-GW-I

Table 1 - Silver Creek Tailings, Park City, Utah

| Sample Date: 08/31/87 | Ground Water Samples | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | MW01S | MW01D | MW12 | MW04 | MW02 | MW03 | MW08 | MW05 | MW06 | MW07 | MW11 | MW09 | MW10 |
| Aluminum (ug/l) | < 400 | < 400 | < 400 | < 400 | < 400 | < 400 | < 400 | < 400 | < 400 | < 400 | < 400 | < 400 | < 400 |
| T-Arsenic (ug/l) | < 1.1 | < 1.1 | < 1.1 | < 1.1 | < 1.1 | < 1.1 | < 1.1 | 1.2 | < 1.1 | 1.5 | 1.5 | 6.5 | 28.0 |
| T-Barium (mg/l) | 0.096 | 0.089 | 0.052 | 0.027 | 0.053 | 0.100 | 0.023 | 0.038 | 0.025 | 0.021 | 0.068 | 0.053 | 0.110 |
| Beryllium (ug/l) | < 1 | 1 | < 1 | < 1 | 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| T-Cadmium (ug/l) | < 1 | 19 | 1 | 6 | 1 | < 1 | 29 | 39 | 35 | 15 | 3 | < 1 | 7 |
| Calcium (mg/l) | 340 | 230 | 67 | 220 | 230 | 180 | 220 | 200 | 240 | 260 | 320 | 200 | 130 |
| Chloride (mg/l) | 924.9 | 379.9 | 37.5 | 132.5 | 357.4 | 344.9 | 155.0 | 125.0 | 132.5 | 110.0 | 155.0 | 147.5 | 92.4 |
| T-Chromium (ug/l) | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 | < 30.0 |
| Cobalt (ug/l) | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| T-Copper (ug/l) | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 |
| Cyanide (mg/l) | < 0.023 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| T-Iron (mg/l) | < 0.020 | 0.079 | 0.670 | 0.290 | 0.095 | < 0.020 | < 0.020 | 0.380 | 0.160 | < 0.020 | 0.320 | 0.050 | < 0.020 |
| T-Lead (ug/l) | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 30.0 |
| Magnesium (mg/l) | 60 | 44 | 18 | 39 | 44 | 36 | 32 | 34 | 33 | 33 | 59 | 32 | 36 |
| T-Manganese (ug/l) | 94.0 | 430.0 | 43.0 | 300.0 | 110.0 | 8.0 | 420.0 | 120.0 | 440.0 | 240.0 | 570.0 | 1200.0 | 1100.0 |
| Mercury (ug/l) | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Potassium (mg/l) | 3 | 2 | 1 | 7 | 2 | 2 | 7 | 4 | 5 | 6 | 2 | 3 | 3 |
| T-Selenium (ug/l) | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| T-Silver (ug/l) | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Sodium (mg/l) | 260 | 77 | 12 | 53 | 53 | 110 | 48 | 54 | 42 | 52 | 42 | 64 | 45 |
| Sulfate (mg/l) | 250 | 240 | 83 | 530 | 210 | 180 | 490 | 500 | 550 | 660 | 500 | 330 | 230 |
| T-Zinc (ug/l) | 25.0 | 19.0 | 40.0 | 1700.0 | 26.0 | < 15.0 | 2800.0 | 2100.0 | 1100.0 | 2000.0 | 18.0 | < 15.0 | 1800.0 |

MW=Monitoring Well

Analyzed by: State Health Laboratory, Salt Lake City, Utah

Table 1 - Silver Creek Tailings, Park City, Utah

| Sample Date: 08/31/87 | | |
|---|---|---|
| Parameter | DR02 | DR01 |
| Aluminum (ug/l) | < 400 | < 400 |
| T-Arsenic (ug/l) | 4.5 | 13.5 |
| T-Barium (mg/l) | 0.050 | 0.025 |
| Beryllium (ug/l) | 2 | 1 |
| T-Cadmium (ug/l) | 12000 | 32 |
| Calcium (mg/l) | 150 | 250 |
| Chloride (mg/l) | 40.0 | 150.0 |
| T-Chromium (ug/l) | < 30.0 | < 30.0 |
| Cobalt (ug/l) | < 20 | < 20 |
| T-Copper (ug/l) | < 20.0 | < 20.0 |
| Cyanide (mg/l) | < 0.02 | < 0.02 |
| T-Iron (mg/l) | 5.800 | 0.860 |
| T-Lead (ug/l) | < 5.0 | < 5.0 |
| Magnesium (mg/l) | 39 | 35 |
| T-Manganese (ug/l) | 560.0 | 980.0 |
| Mercury (ug/l) | < 0.2 | < 0.2 |
| Potassium (mg/l) | 2 | 5 |
| T-Selenium (ug/l) | < 0.5 | < 0.5 |
| T-Silver (ug/l) | < 2.0 | < 2.0 |
| Sodium (mg/l) | 14 | 53 |
| Sulfate (mg/l) | 330 | 550 |
| T-Zinc (ug/l) | 450.0 | 3500.0 |

DR=Drain

SHL - GW - II

Silver Creek Tailings, Park City, Utah
Sample Date: 11/30/87

Ground Water Samples

| Parameter | MW1 | MW1D | MW12 | MW4 | MW2 | MW3 | MW8 | MW5 | MW6 | MW7 | MW11 | MW9 | MW10 | MW9D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tot. Alk. (mg/1) | 137 | 114 | 119 | 104 | 121 | 154 | 57 | 80 | 57 | 59 | 200 | 218 | 223 | 216 |
| Aluminum (ug/1) | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 |
| T-Arsenic (ug/1) | <1.1 | <1.1 | 2.5 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | 5.0 | 13.0 | 5.0 |
| T-Barium (mg/1) | 0.094 | 0.07 | 0.06 | 0.04 | 0.055 | 0.07 | 0.021 | 0.045 | 0.022 | 0.02 | 0.037 | 0.05 | 0.091 | 0.049 |
| Beryllium (ug/1) | 2 | 1 | <1 | 2 | <1 | 1 | <1 | 1 | <1 | 2 | <1 | <1 | <1 | <1 |
| Bicarbonate (mg/1) | 168 | 140 | 146 | 128 | 148 | 188 | 70 | 98 | 70 | 72 | 244 | 266 | 272 | 263 |
| T-Cadmium (ug/1) | 175 | 75 | 4 | 3 | 80 | 35 | 12 | 35 | 355 | 8 | <1 | <5 | 3 | 5 |
| Calcium (mg/1) | 340 | 260 | 72 | 240 | 230 | 170 | 200 | 190 | 240 | 260 | 220 | 210 | 130 | 210 |
| Carbonate (mg/1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chloride (mg/1) | 884.9 | 450 | 83.9 | 130 | 362.4 | 299.9 | 132 | 105 | 130 | 110 | 170 | 135 | 96.9 | 138 |
| T-Chromium (ug/1) | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Cobalt (ug/1) | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| T-Copper (ug/1) | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 |
| Cyanide (mg/1) | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| T-Iron (mg/1) | 0.95 | 0.051 | <0.02 | 0.12 | 0.033 | <0.02 | <0.02 | 0.086 | 1.5 | 0.044 | <0.02 | 0.26 | 0.021 | 0.25 |
| T-Lead (ug/1) | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | 15.0 | <5.0 |
| Magnesium (mg/1) | 63 | 52 | 20 | 39 | 46 | 34 | 26 | 34 | 32 | 31 | 38 | 33 | 39 | 33 |
| T-Manganese(ug/1) | 90.0 | 75 | 8.0 | 1800.0 | 30.0 | 6.0 | 430.0 | 260.0 | 280.0 | 68.0 | 240.0 | 1500.0 | 420.0 | 1600.0 |
| Mercury (ug/1) | <0.2 | <0.2 | 0.3 | <0.2 | 0.2 | <0.2 | 0.25 | 0.2 | <0.2 | 0.2 | 0.37 | 0.2 | 0.2 | 0.2 |
| T-Nickel (ug/1) | <10.0 | <10.0 | <10.0 | <10.0 | <10.0 | <10.0 | 10.0 | <10.0 | 10.0 | 15.0 | <10.0 | <10.0 | <10.0 | <10.0 |
| Potassium (mg/1) | 3 | 2 | <1 | 6 | 2 | 2 | 6 | 3 | 4 | 6 | 2 | 3 | 2 | 3 |
| T-Selenium (ug/1) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| T-Silver (ug/1) | 2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Sodium (mg/1) | 280 | 88 | 10 | 51 | 54 | 110 | 44 | 48 | 40 | 51 | 35 | 60 | 41 | 60 |
| Sulfate (mg/1) | 270 | 270 | 84 | 540 | 210 | 200 | 430 | 470 | 540 | 640 | 300 | 340 | 190 | 330 |
| T-Zinc (ug/1) | 69.0 | <20.0 | <20.0 | 640.0 | 41.0 | <20.0 | 2700.0 | 930.0 | 1400.0 | 2400.0 | <20.0 | <20.0 | 680.0 | <20.0 |

NOTE: MW9D is a Duplicate Sample for MW9

BSHW/5582U/1

Silver Creek Tailings, Park City, Utah
Sample Date: 11/30/87

Drain Samples

| Parameter | DR1 | DR2 | DR3 | DR4 | DR5 |
|---|---|---|---|---|---|
| Tot. Alk. (mg/1) | 104 | 313 | 3 | - | - |
| Aluminum (ug/1) | <400 | <400 | <400 | <400 | <400 |
| T-Arsenic (ug/1) | 5.5 | 7.5 | <0.5 | 8.0 | <1.1 |
| T-Barium (mg/1) | 0.021 | 0.069 | <0.005 | <0.005 | <0.005 |
| Beryllium (ug/1) | <1 | <1 | <1 | 9 | <1 |
| Bicarbonate (mg/1) | 128 | 382 | 4 | - | - |
| T-Cadmium (ug/1) | 15 | 1 | <1 | 3 | <1 |
| Calcium (mg/1) | 240 | 240 | <1 | - | - |
| Carbonate (mg/1) | 0 | 0 | 0 | - | - |
| Chloride (mg/1) | 156 | 172.5 | <1 | - | - |
| T-Chromium (ug/1) | <5.0 | <5.0 | <5.0 | 10.0 | <5.0 |
| Cobalt (ug/1) | <20 | <20 | 24 | <20 | <20 |
| T-Copper (ug/1) | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 |
| Cyanide (mg/1) | <0.02 | <0.02 | <0.02 | - | - |
| T-Iron (mg/1) | 0.29 | 6.1 | <0.02 | <0.02 | <0.02 |
| T-Lead (ug/1) | <5.0 | <5.0 | <5.0 | 10.0 | <5.0 |
| Magnesium (mg/1) | 32 | 47 | <1 | - | - |
| T-Manganese(ug/1) | 630.0 | 2000.0 | <5.0 | 9.0 | <5.0 |
| Mercury (ug/1) | <0.2 | <0.2 | <0.2 | 0.3 | <0.2 |
| T-Nickel (ug/1) | 10.0 | <10.0 | <10.0 | 10.0 | <10.0 |
| Potassium (mg/1) | 4 | 3 | <1 | - | - |
| T-Selenium (ug/1) | <0.5 | <0.5 | <0.5 | 4.0 | <0.5 |
| T-Silver (ug/1) | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Sodium (mg/1) | 51 | 44 | <1 | - | - |
| Sulfate (mg/1) | 500 | 270 | 1 | - | - |
| T-Zinc (ug/1) | 2700.0 | 240.0 | <20.0 | <30.0 | <20.0 |

NOTE: DR3 is a Rinsate Blank Sample
DR4 is a Performance Evaluation Sample
DR5 is a Field Blank Sample

BSHW/5582U/2

SHL-GW-III

Silver Creek Tailings, Park City, Utah
Sample Date: 2/24/88

Ground Water Samples

| Parameter | MW1D | MW12 | MW4 | MW2 | MW3 | MW8 | MW5 | MW5D | MW6 | MW7 | MW7D | MW11 | MW11D | MW11D2 | MW9 | MW10 | MW13 | MW14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tot. Alk. (mg/l) | 113 | 117 | 97 | 121 | 155 | 59 | 104 | 114 | 56 | 56 | 119 | 177 | 170 | 171 | 196 | 203 | 689 | 534 |
| Aluminum (ug/l) | <200 | <200 | <200 | <200 | <200 | <200 | <200 | 460 | <200 | <200 | <200 | <200 | <200 | <200 | <200 | <200 | 780 | <200 |
| T-Arsenic (ug/l) | <1 | 2 | 1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | 2 | 11 | <1 | <1 |
| T-Barium (mg/l) | 0.063 | 0.059 | 0.043 | 0.054 | 0.071 | 0.017 | 0.031 | 0.082 | 0.026 | 0.016 | 0.035 | 0.029 | 0.052 | 0.052 | 0.035 | 0.075 | 0.072 | 0.087 |
| Beryllium (ug/l) | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| T-Cadmium (ug/l) | <1 | 1 | 2 | <1 | <1 | 14 | <1 | <1 | 6 | 8 | <1 | <1 | <1 | <1 | <1 | 2 | <1 | <1 |
| Calcium (mg/l) | 260 | 73 | 230 | 240 | 160 | 190 | 210 | 110 | 220 | 240 | 44 | 180 | 92 | 86 | 170 | 120 | 270 | 220 |
| Chloride (mg/l) | 499.9 | 37 | 262.4 | 359.9 | 309.9 | 135 | 90 | 34.9 | 127 | 120 | 12 | 178 | 38.9 | 38 | 151 | 101 | 12 | 53.9 |
| T-Chromium (ug/l) | <5 | <5 | <5 | <5 | <5 | 14 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 100 | 125 |
| Cobalt (ug/l) | <20 | <20 | <20 | <20 | <20 | <5 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| T-Copper (ug/l) | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | 23 | <20 | <20 | <20 | <20 | <20 | <20 |
| Cyanide (mg/l) | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| T-Iron (mg/l) | <0.02 | 0.028 | 0.091 | 0.025 | 0.027 | 0.022 | 0.02 | 0.26 | <0.02 | 0.13 | 0.065 | 0.12 | 0.99 | 0.026 | 0.61 | 0.028 | <0.02 | 0.026 |
| T-Lead (ug/l) | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 15 | <5 | <5 |
| Magnesium (mg/l) | 48 | 19 | 40 | 43 | 31 | 27 | 37 | 27 | 29 | 29 | 12 | 37 | 24 | 24 | 30 | 35 | <1 | <1 |
| T-Manganese(ug/l) | 16 | <5 | 2700 | 64 | 7 | 110 | 100 | 470 | 85 | 32 | 160 | 140 | 480 | 470 | 850 | 380 | <5 | <5 |
| Mercury (ug/l) | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | 0.25 | 8.3 | <0.2 | <0.2 | <0.2 | <0.2 | 0.3 | 14.9 | <0.2 | <0.2 |
| T-Nickel (ug/l) | <10 | <10 | 10 | <10 | <10 | <10 | <10 | <10 | <10 | 15 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Potassium (mg/l) | 2 | 1 | 7 | 2 | 2 | 6 | 2 | 2 | 4 | 5 | 1 | 2 | 1 | 2 | 2 | 2 | 5 | 6 |
| T-Selenium (ug/l) | <5 | <0.5 | <0.5 | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 |
| T-Silver (ug/l) | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Sodium (mg/l) | 88 | 10 | 80 | 50 | 110 | 39 | 40 | 16 | 38 | 51 | 12 | 28 | 16 | 15 | 50 | 35 | 14 | 32 |
| Sulfate (mg/l) | 250 | 94 | 450 | 200 | 180 | 410 | 500 | 250 | 500 | 590 | 45 | 250 | 130 | 130 | 270 | 160 | 12 | 63 |
| T-Zinc (ug/l) | 44 | 71 | 400 | 89 | 52 | 2100 | 97 | 59 | 1100 | 2100 | 42 | 47 | 39 | 29 | 51 | 610 | 60 | 66 |

NOTE: MW11D2 IS A DUPLICATE SAMPLE FOR MW11D
MW5 WAS ANALYZED FOR VOLATILE ORGANICS BUT NONE FOUND

BSHW/5582U/3

Silver Creek Tailings, Park City, Utah
Sample Date: 2/24/88

Drain Samples

| Parameter | DR1 | DR2 | DR3 |
|---|---|---|---|
| Tot. Alk. (mg/l) | 114 | 2.0 | 0 |
| Aluminum (ug/l) | <200 | <200 | <200 |
| T-Arsenic (ug/l) | 7 | <1 | 10 |
| T-Barium (mg/l) | 0.022 | <0.005 | <5 |
| Beryllium (ug/l) | <1 | <1 | 10 |
| T-Cadmium (ug/l) | 8 | <1 | 2 |
| Calcium (mg/l) | 210 | <1 | 2 |
| Chloride (mg/l) | 190 | <1 | 2 |
| T-Chromium (ug/l) | <5 | <5 | 10 |
| Cobalt (ug/l) | <20 | <20 | <20 |
| T-Copper (ug/l) | <20 | <20 | <20 |
| Cyanide (mg/l) | <0.02 | <0.02 | - |
| T-Iron (mg/l) | 0.48 | 0.41 | <20 |
| T-Lead (ug/l) | <5 | <5 | <5 |
| Magnesium (mg/l) | 30 | <1 | <1 |
| T-Manganese(ug/l) | 840 | <5 | 9 |
| Mercury (ug/l) | <0.2 | <0.25 | <0.55 |
| T-Nickel (ug/l) | <10 | <10 | 10 |
| Potassium (mg/l) | 4 | <1 | <1 |
| T-Selenium (ug/l) | 0.5 | <0.5 | 3 |
| T-Silver (ug/l) | <2 | <2 | <2 |
| Sodium (mg/l) | 73 | <1 | <1 |
| Sulfate (mg/l) | 400 | <1 | 1 |
| T-Zinc (ug/l) | 1900 | 42 | 53 |

NOTE: DR2 IS A RINSATE BLANK SAMPLE
DR3 IS A PERFORMANCE EVALUATION SAMPLE

BSHW/5582U/4

BLIND SPIKE SOLUTION PREPARED AS A
COMPARATABILITY STANDARD FOR CASE
THE THIRD ROUND OF WATER SAMPLING
AT PARK CITY, UTAH

RECEIVED
MAY 2 1988
Utah Dept of Health
Bureau of Solid & Hazardous Waste

| PARAMETER | TRUE VALUE | AVERAGE | 95% CONFIDENCE INTERVAL |
|---|---|---|---|
| Aluminum | 50 | 52.26 | 42.3-62.3 |
| Arsenic | 10 | 9.92 | 7.72-12.1 |
| Beryllium | 10 | 9.89 | 8.61-11.2 |
| Cadmium | 2.5 | 2.38 | 1.99-2.77 |
| Cobalt | 10 | 9.90 | 8.55-11.3 |
| Chromium | 10 | 9.81 | 7.77-11.8 |
| Copper | 10 | 10.02 | 8.78-11.3 |
| Iron | 10 | 10.09 | 8.33-11.9 |
| Mercury | .5 | .490 | .338-.642 |
| Manganese | 10 | 9.92 | 8.76-11.1 |
| Nickel | 10 | 9.99 | 8.41-11.6 |
| Lead | 10 | 9.96 | 8.28-11.6 |
| Selenium | 2.5 | 2.31 | 1.50-3.12 |
| Vanadium | 25 | 25.6 | 21.3-29.9 |
| Zinc | 10 | 10.07 | 8.59-11.5 |

-- All values are expressed as µg/l.

SHL-GW-IV

Silver Creek Tailings, Park City, Utah
Sample Date: 4/11/88

Ground Water Samples

| Parameter | MW1S | MW1D | MW12 | MW2 | MW3 | MW8 | MW4 | MW5 | MW5D | MW7 | MW7D | MW6 | MW9 | MW10 | MW11 | MW11D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tot. Alk. (mg/l) | 138 | 113 | 119 | 121 | 150 | 56 | 60 | 63 | 115 | 58 | 123 | 55 | 212 | 227 | 170 | 170 |
| Aluminum (ug/l) | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 | <400 |
| T-Arsenic (ug/l) | <1 | 1.5 | <1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | <1.1 | 2.5 | 14 | <1 | <1 |
| T-Barium (mg/l) | 0.1 | .065 | 0.06 | 0.054 | .076 | .022 | .022 | 0.032 | 0.067 | 0.014 | 0.046 | 0.022 | .043 | 0.091 | .025 | 0.051 |
| Beryllium (ug/l) | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate (mg/l) | 169 | 138 | 145 | 147 | 184 | 68 | 74 | 77 | 141 | 71 | 150 | 67 | 259 | 277 | 208 | 208 |
| T-Cadmium (ug/l) | <1 | <1 | <1 | <1 | <1 | 22 | 8 | 50 | <1 | <1 | <1 | 8 | <1 | 7 | <1 | <1 |
| Calcium (mg/l) | 320 | 260 | 70 | 220 | 170 | 230 | 190 | 180 | 110 | 230 | 43 | 230 | 220 | 150 | 190 | 89 |
| Carbonate (mg/l) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chloride (mg/l) | 899.9 | 534.9 | 39.5 | 364.9 | 349.9 | 171 | 153 | 130 | 31.9 | 120 | 12.3 | 138 | 227.5 | 115 | 187.5 | 39 |
| T-Chromium (ug/l) | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| Cobalt (ug/l) | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| T-Copper (ug/l) | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <20 |
| Cyanide (mg/l) | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| T-Iron (mg/l) | <0.02 | <0.02 | <0.02 | <0.02 | 0.17 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | .026 | <0.02 | 0.95 | <0.02 | <0.02 | <0.02 |
| T-Lead (ug/l) | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 20 | <5 | <5 |
| Magnesium (mg/l) | 55 | 49 | 20 | 42 | 32 | 30 | 33 | 32 | 26 | 28 | 11 | 30 | 37 | 41 | 34 | 24 |
| T-Manganese(ug/l) | 22 | 12 | <5 | <5 | 13 | 120 | 46 | 44 | 86 | 11 | 420 | 57 | 1100 | 1200 | 120 | 250 |
| Mercury (ug/l) | 0.23 | 0.23 | <0.2 | 2.6 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | 0.023 | <0.2 | <0.2 |
| T-Nickel (ug/l) | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Potassium (mg/l) | 3 | 2 | <1 | 2 | 2 | 6 | 7 | 4 | 1 | 5 | <1 | 4 | 2 | 2 | 2 | 1 |
| T-Selenium (ug/l) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| T-Silver (ug/l) | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Sodium (mg/l) | 270 | 87 | 10 | 49 | 110 | 49 | 52 | 50 | 15 | 49 | 11 | 40 | 66 | 43 | 28 | 16 |
| Sulfate (mg/l) | 240 | 240 | 90 | 210 | 180 | 520 | 470 | 460 | 240 | 580 | 44 | 530 | 330 | 250 | 240 | 130 |
| T-Zinc (ug/l) | <20 | <20 | <20 | <20 | 26 | 2900 | 2400 | 1900 | <20 | 2100 | <20 | 1600 | <20 | 1800 | <20 | <20 |

BSHW/5582U/5

**Silver Creek Tailings, Park City, Utah**
**Sample Date: 4/11/88**

| Parameter | MW1A | MW1B | MW1C | MW11B | MW11D1 | DR1 |
|---|---|---|---|---|---|---|
| Tot. Alk. (mg/1) | 1.0 | 3.0 | 1.0 | 3.0 | 169 | 91 |
| Aluminum (ug/1) | <400 | <400 | 410 | <400 | <400 | <400 |
| T-Arsenic (ug/1) | 7.5 | <1 | 99.5 | <1 | <1 | <1 |
| T-Barium (mg/1) | <.005 | <.005 | <.005 | <.005 | .053 | .018 |
| Beryllium (ug/1) | 10 | <1 | 99 | <1 | <1 | <1 |
| Bicarbonate (mg/1) | 2 | 4 | 2 | 3 | 206 | 111 |
| T-Cadmium (ug/1) | 2 | <1 | 22 | <1 | <1 | 19 |
| Calcium (mg/1) | <1 | <1 | <1 | <1 | 90 | 250 |
| Carbonate (mg/1) | 0 | 0 | 0 | 0 | 0 | 0 |
| Chloride (mg/1) | <1 | <1 | 11 | 2.5 | 40.5 | 172.5 |
| T-Chromium (ug/1) | 10 | <5 | 100 | <5 | <5 | <5 |
| Cobalt (ug/1) | <20 | <20 | 98 | <20 | <20 | <20 |
| T-Copper (ug/1) | <20 | <20 | 89 | <20 | <20 | <20 |
| Cyanide (mg/1) | <0.02 | <0.02 | - | <0.02 | <0.02 | <0.02 |
| T-Iron (mg/1) | <0.02 | <0.02 | 0.1 | <0.02 | <0.02 | <0.12 |
| T-Lead (ug/1) | 10 | <5 | 105 | <5 | <5 | <5 |
| Magnesium (mg/1) | <1 | <1 | <1 | <1 | 24 | 33 |
| T-Manganese(ug/1) | 9 | <5 | 89 | <5 | 260 | 530 |
| Mercury (ug/1) | 0.41 | <0.2 | 4.8 | <0.2 | <0.2 | <0.2 |
| T-Nickel (ug/1) | <10 | <10 | 100 | <10 | <10 | <10 |
| Potassium (mg/1) | <1 | <1 | <1 | <1 | 1 | 4 |
| T-Selenium (ug/1) | <0.5 | <0.5 | 21 | <0.5 | <0.5 | <0.5 |
| T-Silver (ug/1) | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Sodium (mg/1) | <1 | <1 | <1 | 1 | 16 | 52 |
| Sulfate (mg/1) | <1 | <1 | <1 | 1 | 130 | 510 |
| T-Zinc (ug/1) | <20 | <20 | 180 | <20 | <20 | 2800 |

NOTE: MW1A is a Performance Evaluation Sample (Lower Range)
MW1C is a Performance Evaluation Sample (Higher Range)
MW1B is a Field Blank Sample
MW11B is a Rinsate Blank Sample
MW11D1 IS A DUPLICATE SAMPLE FOR MW11D

BSHW/5582U/6

BLIND SPIKE SOLUTION PREPARED AS A
COMPARATABILITY STANDARD FOR CASE
THE FOURTH ROUND OF WATER SAMPLING
AT PARK CITY, UTAH

| PARAMETER | TRUE VALUE | AVERAGE | 95% CONFIDENCE INTERVAL |
|---|---|---|---|
| Aluminum (low) | 50 | 52.26 | 42.3-62.3 |
| Aluminum (high) | 500 | 506.0 | 427-585 |
| Arsenic (low) | 10 | 9.92 | 7.72-12.1 |
| Arsenic (high) | 100 | 99.2 | 80.0-118 |
| Beryllium (low) | 10 | 9.89 | 8.61-11.2 |
| Beryllium (high) | 100 | 99.4 | 88.7-110 |
| Cadmium (low) | 2.5 | 2.38 | 1.99-2.77 |
| Cadmium (high) | 25 | 24.4 | 21.2-27.7 |
| Cobalt (low) | 10 | 9.90 | 8.55-11.3 |
| Cobalt (high) | 100 | 99.5 | 86.8-112 |
| Chromium (low) | 10 | 9.81 | 7.77-11.8 |
| Chromium (high) | 100 | 99.8 | 84.4-115 |
| Copper (low) | 10 | 10.02 | 8.78-11.3 |
| Copper (high) | 100 | 99.1 | 89.4-109 |
| Iron (low) | 10 | 10.09 | 8.33-11.9 |
| Iron (high) | 100 | 100.2 | 82.7-118 |
| Mercury (low) | .5 | .490 | .338-.642 |
| Mercury (high) | 5.0 | 5.05 | 3.85-6.25 |
| Manganese (low) | 10 | 9.92 | 8.76-11.1 |
| Manganese (high) | 100 | 98.8 | 88.4-109 |
| Nickel (low) | 10 | 9.99 | 8.41-11.6 |
| Nickel (high) | 100 | 100.4 | 88.0-113 |
| Lead (low) | 10 | 9.96 | 8.28-11.6 |
| Lead (high) | 100 | 100.1 | 85.1-115 |
| Selenium (low) | 2.5 | 2.31 | 1.50-3.12 |
| Selenium (high) | 25 | 22.8 | 17.4-28.3 |
| Vanadium (low) | 25 | 25.6 | 21.3-29.9 |
| Vanadium (high) | 250 | 250.90 | 220-282 |
| Zinc (low) | 10 | 10.07 | 8.59-11.5 |
| Zinc (high) | 100 | 99.8 | 89.0-111 |

-- Statistics provided by Environmental Monitoring and Support Laboratory - Cincinnati
-- U.S. EPA QC samples used were (low - Trace Metal I, 6020, WP386 and High - Trace Metal - I, 7248, WP287)
-- All values are expressed as µg/l
-- Two spiked solutions were prepared for the fourth round of sampling as "low" and "high", both values are listed across from their respective parameter, low values on top.

SHL-SW-I

Sample Location Description

Silver Creek Tailings

| Sample Number | Sample Location |
|---|---|
| 87125 | Silver Creek below Prospector Square |
| 87126 | Silver Creek below Wyatt Earp Drive |
| 87127 | Silver Creek at Bonanza Drive |
| 87128 | Silver Creek at Bonanza Drive |
| 87129 | Pace-Homer Ditch below Prospector Square |
| 87130 | Pace-Homer Ditch at Park Meadows collection box |

Note: 87125, 87126, 87127, 87128, 87129, and 87130 are unfiltered samples.

87125A, 87126A, 87127A, 87128A, 87129A, and 87130A are filtered samples.

87125B, 87127B, and 87129B are sediment samples.

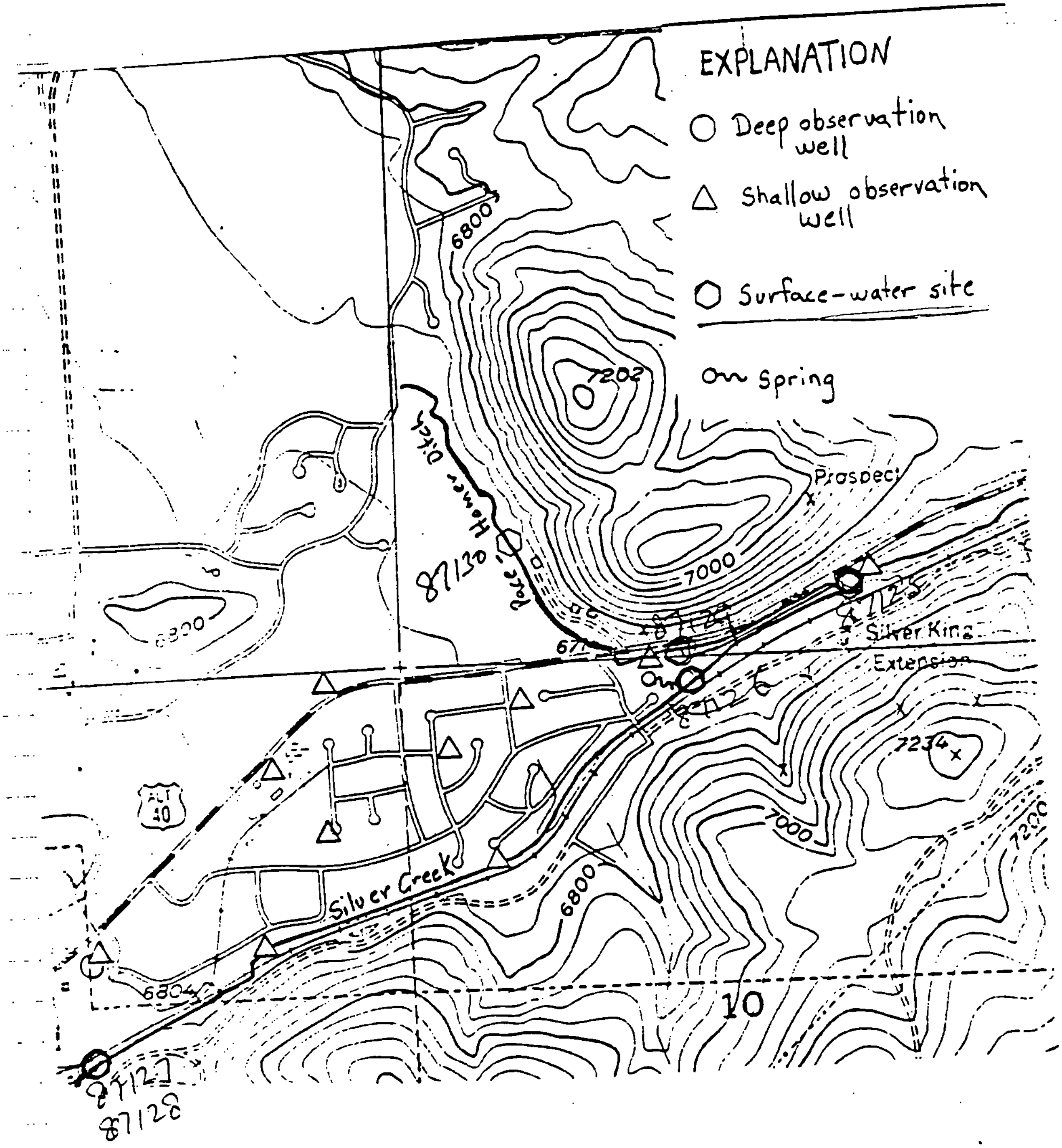



Figure 3.- Approximate locations of ground- and surface-water monitoring sites.

Table 1
Silver Creek Tailings

| Sample Date: 4/29/87 | Surface Water Samples (unfiltered) | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | CW87131 | CW87130 | CW87129 | CW87128 | CW87127 | CW87126 | CW87125 |
| pH (no units) | 5.6 | 8.0 | 8.1 | 8.3 | 8.3 | 8.3 | 7.5 |
| Alkalinity (mg/l) | 2 | 164 | 175 | 98 | 100 | 95 | 145 |
| Conductance (umhos) | 2 | 754 | 845 | 1022 | 1030 | 1031 | 1028 |
| Calcium (mg/l) | < 1 | 91 | 100 | 77 | 77 | 78 | 120 |
| Chloride (mg/l) | < 1.0 | 27.0 | 15.5 | 54.9 | 173 | 174 | 98.0 |
| Cyanide (mg/l) | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Sulfate (mg/l) | < 1 | 180 | 170 | 110 | 110 | 120 | 210 |
| Aluminum (ug/l) | < 200 | < 200 | < 200 | 570 | 580 | 500 | < 200 |
| T-Arsenic (ug/l) | < 1.1 | 10.5 | 7.5 | 18.5 | 18.0 | 14.0 | 10.0 |
| T-Barium (mg/l) | < 0.005 | 0.051 | 0.025 | 0.090 | 0.091 | 0.080 | 0.044 |
| Beryllium (ug/l) | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| T-Cadmium (ug/l) | < 1 | < 1 | < 1 | 6 | 5 | 4 | 6 |
| T-Chromium (ug/l) | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cobalt (ug/l) | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| T-Copper (ug/l) | < 20.0 | < 20.0 | < 20.0 | 40.0 | 38.0 | 31.0 | < 20.0 |
| T-Iron (mg/l) | < 0.020 | 0.082 | 0.061 | 1.600 | 1.600 | 1.100 | 0.580 |
| T-Lead (ug/l) | < 5.0 | < 5.0 | 30.0 | 640.0 | 700.0 | 430.0 | 165.0 |
| Magnesium (mg/l) | < 1 | 31 | 30 | 16 | 16 | 16 | 27 |
| T-Manganese (mg/l) | < 5.0 | 170.0 | 82.0 | 290.0 | 290.0 | 350.0 | 410.0 |
| Mercury (ug/l) | 0.15 | 0.25 | 0.75 | 1.40 | 0.75 | 0.55 | 0.65 |
| T-Nickel (ug/l) | < 10.0 | < 10.0 | < 10.0 | < 10.0 | < 10.0 | < 10.0 | < 10.0 |
| Potassium (mg/l) | < 1 | 2 | 2 | 3 | 3 | 3 | 3 |
| T-Selenium (ug/l) | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 2.0 | < 0.5 |
| T-Silver (ug/l) | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Sodium (mg/l) | < 1 | 17 | 22 | 96 | 97 | NM | 45 |
| T-Zinc (ug/l) | < 15.0 | 31.0 | 62.0 | 860.0 | 870.0 | 560.0 | 780.0 |

Table 2
Silver Creek Tailings

| Sample Date: 4/29/87 | Surface Water Samples (filtered) | | | | | |
|---|---|---|---|---|---|---|
| Parameter | CW87131A | CW87130A | CW87129A | CW87127A | CW87126A | CW87125A |
| pH (no units) | QO | 8.1 | 7.9 | 8.2 | 8.4 | 7.8 |
| Conductance (umhos) | QO | 745 | 835 | 1021 | 1055 | 1028 |
| Calcium (mg/l) | 8 | 91 | 100 | 76 | 83 | 120 |
| Aluminum (ug/l) | 210 | < 200 | < 200 | < 200 | < 200 | < 200 |
| D-Arsenic (ug/l) | 45.0 | 12.5 | 5.5 | 5.5 | 4.5 | 5.5 |
| D-Barium (ug/l) | < 5.0 | 50.0 | 23.0 | 74.0 | 75.0 | 41.0 |
| T-Barium (ug/l) | NM | NM | NM | 74.0 | NM | 41.0 |
| Beryllium (ug/l) | 49 | < 1 | < 1 | < 1 | < 1 | < 1 |
| D-Cadmium (ug/l) | 41.0 | < 1.0 | < 1.0 | 1.0 | 2.0 | 4.0 |
| D-Chromium (ug/l) | 45.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cobalt (ug/l) | 40 | < 20 | < 20 | < 20 | < 20 | < 20 |
| D-Copper (ug/l) | 47.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 | < 20.0 |
| D-Iron (mg/l) | 45.0 | 32.0 | 580.0 | 40.0 | < 20.0 | < 20.0 |
| D-Lead (ug/l) | 60.0 | < 5.0 | 5.0 | 10.0 | 10.0 | 10.0 |
| Magnesium (mg/l) | < 1 | 31 | 31 | 15 | 17 | 27 |
| D-Manganese (mg/l) | 50.0 | 170.0 | 75.0 | 120.0 | 260.0 | 360.0 |
| Mercury (ug/l) | 2.34 | 0.20 | 0.25 | < 0.25 | 0.20 | 0.25 |
| D-Nickel (ug/l) | 45.0 | < 10.0 | < 10.0 | < 10.0 | < 10.0 | < 10.0 |
| Potassium (mg/l) | 2 | 2 | 2 | 3 | 3 | 2 |
| D-Selenium (ug/l) | 9.0 | < 0.5 | < 0.5 | 1.0 | 1.0 | < 0.5 |
| D-Silver (ug/l) | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Sodium (mg/l) | 2 | 17 | 22 | 96 | 100 | 44 |
| D-Zinc (ug/l) | 55.0 | 33.0 | 52.0 | 59.0 | 70.0 | 590 |

Table 3
Silver Creek Tailings

| Parameter (mg/l) | Sediment Samples | | |
|---|---|---|---|
| | CW87129B | CW87127B | CW87125B |
| % Solids | 20.8 | 56.1 | 59.5 |
| T-Arsenic | 190.0 | 180.0 | 300.0 |
| Aluminum | 28000 | 21000 | 16000 |
| T-Barium | 210.0 | 180.0 | 37.0 |
| T-Cadmium | 32.0 | 29.0 | 72.0 |
| T-Chromium | 49.0 | 49.0 | 31.0 |
| Cobalt | 10.0 | 8.6 | 8.0 |
| T-Copper | 360.0 | 240.0 | 360.0 |
| T-Iron | 25000.0 | 22000.0 | 30000.0 |
| T-Lead | 3600.0 | 4500.0 | 4300.0 |
| T-Manganese | 1500.0 | 1400.0 | 1300.0 |
| Mercury | 7.0 | 2.5 | 5.5 |
| T-Nickel | 18.0 | 15.0 | 13.0 |
| T-Selenium | < 40.0 | < 13.0 | < 12.0 |
| T-Silver | 26.0 | 21.0 | 31.0 |
| T-Zinc | 4500.0 | 4000.0 | 9300.0 |

SHL-SW-II

Table A

Surface Water Sampling Locations Description
Silver Creek Tailings
Park City, Utah

| Sample Number | Sample Locations |
|---|---|
| CW87150 | Silver Creek Below Prospector Square |
| CW87151 | Silver Creek Below Wyatt Earp Drive |
| CW87152 | Silver Creek at Bonanza Drive |
| CW87153 | Silver Creek at Bonanza Drive |
| CW87154 | Pace-Homer Ditch Below Prospector Square |
| CW87155 | Pace-Homer Ditch at Park Meadows Collection Box |

Note: 87150, 87151, 87152, 87153, 87154, and 87155 are unfiltered samples.
87150A, 87151A, 87152A, 87153A, 87154A, and 87155A are filtered samples.
87150B, 87151B, 87152B, 87153B, 87154B, and 87155B are sediment samples.

Table 1

Silver Creek Tailings
Park City, Utah

Surface Water Samples -- Unfiltered
Sample Date: 8-30-87

Samples Analyzed by:
State Health Laboratory
Salt Lake City, Utah

| Parameter (ug/l | CW7155 | CW87154 | CW87153 | CW87152 | CW87151 | CW87150 |
|---|---|---|---|---|---|---|
| T-Arsenic | 19.0 | 13.0 | 7.5 | 7.0 | 3.5 | 16.0 |
| T-Barium | 23.0 | 31.0 | 52.0 | 51.0 | 62.0 | 47.0 |
| T-Cadmium | <1.0 | 4.0 | <1.0 | <1.0 | 16.0 | 7.0 |
| T-Chromium | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| T-Copper | 56.0 | <20.0 | <20.0 | <20.0 | <20.0 | 22.0 |
| T-Iron | 85.0 | 57.0 | 120.0 | 110.0 | 72.0 | 79.0 |
| T-Lead | <5.0 | <5.0 | 20.0 | 10.0 | <5.0 | 105.00 |
| T-Manganese | 83.0 | 33.0 | 12.0 | 13.0 | 2900.0 | 1000.0 |
| Mercury | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| T-Selenium | <0.5 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| T-Silver | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| T-Zinc | 100.0 | 240.0 | 120.0 | 57.0 | 3300.0 | 2500.0 |

Table 2

Silver Creek Tailings
Park City, Utah

Surface Water Samples -- Filtered
Sample Date: 8-30-87

Samples Analyzed by:
State Health Laboratory
Salt Lake City, Utah

| Parameter (ug/1 | CW7155A | CW87154A | CW87153A | CW87152A | CW87151A | CW87150A |
|---|---|---|---|---|---|---|
| T-Arsenic | 18.5 | 12.5 | 6.0 | 7.0 | 3.2 | 9.5 |
| T-Barium | 22.0 | 30.0 | 51.0 | 51.0 | 62.0 | 49.0 |
| T-Cadmium | <1.0 | <1.0 | <1.0 | 1.0 | 17.0 | 7.0 |
| T-Chromium | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| T-Copper | 30.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 |
| T-Iron | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | 81.0 |
| T-Lead | <5.0 | <5.0 | 20.0 | 10.0 | <5.0 | 105.00 |
| T-Manganese | 57.0 | 11.0 | 11.0 | 11.0 | 2900.0 | 970.0 |
| T-Selenium | <0.5 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| T-Silver | <10.0 | <10.0 | <10.0 | <10.0 | <10.0 | <10.0 |
| T-Zinc | <15.0 | 26.0 | <15.0 | 30.0 | 3300.0 | 2300.0 |

Table 3

Silver Creek Tailings
Park City, Utah

Sediment Samples
Sample Date: 8-30-87

Samples Analyzed by:
State Health Laboratory
Salt Lake City, Utah

| Parameter (mg/l) | CW87154B | CW87153B | CW87152B | CW87151B | CW87150B |
|---|---|---|---|---|---|
| % Solids | 27.5 | 57.7 | 49.1 | 45.8 | 58.4 |
| T-Arsenic | 220.0 | 140.0 | 210.0 | 110.0 | 370.0 |
| Aluminum | 20000.0 | 12000.0 | 16000.0 | 30000.0 | 6300.0 |
| T-Barium | 150.0 | 150.0 | 180.0 | 170.0 | 6.7 |
| Beryllium | 1.0 | 1.0 | 1.2 | 1.4 | 0.4 |
| T-Cadmium | 43.0 | 29.0 | 34.0 | 24.0 | 83.0 |
| T-Chromium | 38.0 | 41.0 | 43.0 | 44.0 | 19.0 |
| Cobalt | 6.0 | 8.0 | 10.0 | 12.0 | 8.0 |
| T-Copper | 430.0 | 170.0 | 250.0 | 69.0 | 580.0 |
| T-Iron | 22000.0 | 23000.0 | 26000.0 | 24000.0 | 32000.0 |
| T-Lead | 4600.0 | 3200.0 | 4300.0 | 960.0 | 7700.0 |
| T-Manganese | 1100.0 | 1300.0 | 1300.0 | 2200.0 | 1700.0 |
| Mercury | 16.0 | 3.6 | 3.7 | 2.2 | 6.5 |
| Molybdenum | <26.0 | <10.0 | <12.0 | <16.0 | <7.0 |
| T-Nickel | <26.0 | 13.0 | 22.0 | 22.0 | 9.0 |
| T-Selenium | <52.0 | <21.0 | <25.0 | <32.0 | 15.0 |
| T-Silver | 36.0 | 15.0 | 22.0 | 5.3 | 51.0 |
| Vanadium | 51.0 | 47.0 | 49.0 | 55.0 | 18.0 |
| T-Zinc | 7400.0 | 4500.0 | 5300.0 | 3300.0 | 15000.0 |

SHL-SW-III

TABLE 1
Silver Creek Tailings, Park City, Utah
SURFACE WATER SAMPLES-UNFILTERED
Sample Date: 04/13/88

| Parameter | Pace Homer at Park Meadows Collection Box | Pace Homer at Diversion | Silver Creek Below Prosector Square | Silver Creek at Wyattearp Drive | Silver Cree[k] at Bonzana Drive |
|---|---|---|---|---|---|
| Tot. Alk. (mg/l) | 186 | 185 | 152 | 109 | 1[illegible] |
| Aluminum (ug/l) | <400 | <400 | <400 | 450 | <4[illegible] |
| T-Arsenic (ug/l) | 5.5 | 3.5 | <3.5 | 5.5 | 2.[illegible] |
| T-Barium (mg/l) | 0.055 | 0.039 | 0.036 | 0.084 | 0.0[illegible] |
| Beryllium (ug/l) | <1 | <1 | <1 | <1 | [illegible] |
| Bicarbonate (mg/l) | 227 | 225 | 185 | 133 | 1[illegible] |
| T-Cadmium (ug/l) | <1 | <1 | 1 | 4 | <[illegible] |
| Calcium (mg/l) | 86 | 100 | 110 | 81 | [illegible] |
| Carbonate (mg/l) | 0 | 0 | 0 | 0 | |
| Chloride (mg/l) | 29.9 | 48 | 147.5 | 259.5 | 267.[illegible] |
| T-Chromium (ug/l) | <5.0 | <5.0 | <5.0 | <5.0 | <5.[illegible] |
| Cobalt (ug/l) | <20 | <20 | <20 | <20 | <[illegible] |
| T-Copper (ug/l) | <20.0 | <20.0 | <20.0 | <20.0 | <20.[illegible] |
| Cyanide (mg/l) | <0.02 | <0.02 | <0.02 | <0.02 | <0.[illegible] |
| T-Iron (mg/l) | 0.083 | 0.057 | <0.02 | 0.77 | <0.[illegible] |
| T-Lead (ug/l) | <5.0 | 10.0 | <5.0 | 05 | <[illegible] |
| Magnesium (mg/l) | 27 | 28 | 26 | 17 | 1[illegible] |
| T-Manganese(ug/l) | 310 | 120 | <5 | 310 | <5 |
| Mercury (ug/l) | <0.2 | <0.2 | <0.2 | <0.2 | <0.[illegible] |
| T-Nickel (ug/l) | 10.0 | <10.0 | <10.0 | <10.0 | <10.[illegible] |
| Potassium (mg/l) | 3 | 2 | 3 | 3 | |
| T-Selenium (ug/l) | <0.5 | <0.5 | 4 | <0.5 | <0.[illegible] |
| T-Silver (ug/l) | <2.0 | <2.0 | <2.0 | <2.0 | <2.[illegible] |
| Sodium (mg/l) | 20 | 22 | 66 | 130 | 13[illegible] |
| Sulfate (mg/l) | 140 | 170 | 180 | 89 | 8[illegible] |
| T-Zinc (ug/l) | <20 | 64 | 100 | 440 | 6[illegible] |

NOTE:

BSHW/5582U/7

T A B L E 2

Silver Creek Tailings
Park City, Utah

Surface Water Samples -- Filtered
Sample Date: 04-13-88

| Parameter | Pace Homer Park Meadows Collection Box | Pace Homer Diversion | Silver Creek BELOW Prospector Square | Silver Creek Wyattarp Drive | Silver Creek at Bonzana Drive |
|---|---|---|---|---|---|
| T-Arsenic | 5.5 | 2.5 | 5.5 | 1.5 | 2.5 |
| T-Barium | 52 | 36 | 39 | 74 | 81 |
| Beryllium | <1 | <1 | <1 | <1 | <1 |
| T-Cadmium | <1 | <1 | <1 | <1 | <1 |
| T-Chromium | <5 | <5 | <5 | <5 | <5 |
| Cobalt | <20 | <20 | <20 | <20 | <20 |
| T-Copper | <20 | <20 | <20 | <20 | <20 |
| T-Iron | 21 | 20 | 20 | 20 | 20 |
| T-Lead | <5 | <5 | <5 | <5 | <5 |
| T. Manganese | 290 | 110 | 170 | 220 | 270 |
| Mercury | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Nickel | <10 | <10 | <10 | <10 | <10 |
| T-Selenium | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| T-Silver | <2 | <2 | <2 | <2 | <2 |
| T-Zinc | 29 | 62 | 270 | 170 | 150 |

5582-8

TABLE 3

Silver Creek Tailings
Park City, Utah

Sediment Samples
Sample Date 4-13-88

| Parameter (mg/l) | Pace Homer at Diversion | Silver Creek BELOW Prospector Square | Silver Creek at Wyattearp Drive | Silver Creek at Bonzana Drive |
|---|---|---|---|---|
| %Solids | 55.6 | 64.5 | 66.9 | 73.4 |
| T-Arsenic | 200 | 370 | 100 | 93 |
| Aluminum | 2000 | 110 | 29,000 | 1780 |
| T-Barium | 170 | 6 | 140 | 200 |
| Beryllium | 1.2 | 6.6 | 1.5 | 1.5 |
| T-Cadmium | 31 | 140 | 14 | 15 |
| T-Chromium | 72 | 30 | 43 | 75.5 |
| Cobalt | 12 | 8 | 11 | 6.5 |
| T-Copper | 440 | 1400 | 63 | 93 |
| T-Iron | 3500 | 30,000 | 29,000 | 2000 |
| T-Lead | 3100 | 12,000 | 380 | 1300 |
| T-Manganese | 1300 | 1900 | 410 | 1800 |
| Mercury | 6.7 | 3.4 | 0.4 | 1.2 |
| T-Nickel | <20 | <20 | 18 | <20 |
| T-Selenium | <20 | <20 | <20 | <20 |
| T-Silver | 20 | 86 | 3 | 6.8 |
| T-Zinc | 4700 | 30,000 | 720 | 2100 |

NOTE: No Sediment sample was available for collection from the Pace Homer Ditch at the collection box location.